Chips

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Cover Story

Features

• Front and Back Cover Designs by Douglas Hamilton •

Editorial

I question most rules: Are they necessary? Can they be bent, circumvented or ignored? What is the price of each infraction? My jaundiced view of rules is probably a result of a childhood trauma – a fashionably convenient explanation for my constant questioning of everything.

However, this latest set of rules must be obeyed – although I will comment on the parts that I think were, hummmm, less than well thought out. Why must these rules be obeyed? Because the price of ignoring them is just too high.

On 18 July 1997, Clifford H. Bernath, Principal Deputy Assistant Secretary for Public Affairs and Anthony M. Valetta (Acting) Principal Deputy Assistant Secretary of Defense for Command, Control, Communications and Intelligence signed into being the "Policy for Establishing and Maintaining A Publicly Accessible DoD Web Information Service."

My compadres, these are RULES. References (a) through (p) are a formidable list of thou shalt nots. Some of them are fairly serious: Joint Ethics Regulations, Security and Policy Review of DoD Information for Public Release and DoD Intelligence Activities.

Scary references aside, the real reason we, you and I who begged for the right to conceive, design, maintain and otherwise work ourselves to death in the exalted name of freedom of information, must police ourselves is that if we don't, someone's going to form a real hard-nosed cop squad to do it for us.

Cop squads come in different flavors. For the sake of argument, envision a squad sent out from the Grand Potentate Organization. Now, these folks would love to swoop down on all of us unregulated, undisciplined, unruled (and sometimes unruly) purveyors of information and hand us four-inch-thick, three-ring binders full of expanded, interpreted, triplicated RULES. You know those kind of RULES: "The official organizational seal will appear one inch from the top of the screen and one inch from the left of the screen on all web pages. The seal will appear in black and white only and will load in a minimum of 18 minutes." "However, all web designers are encouraged to be as creative as possible within these rigid, official guidelines."

Right now the rules put forth by Misters Bernath and Valetta deal squarely with the issues – although like most rules, they are subject to interpretation. The gist of what we need to do to comply appears in paragraph 4.1.1.

Nothing unreasonable. Ensure adequate procedures are in place and followed for:
- Management oversight and regular functional review of the service.
- Operational integrity and security of the computer network supporting these services.
- Validation of the accuracy, consistency, appropriateness and timeliness of all information placed on the service.
- Registration of service with GILS (Government Information Locator Service).
- Funding (what's that?), equipping, training (more humor) necessary to develop and maintain the service. I like a little levity built into my rules.

Many, many words are used to describe what should be just common sense. My advice to the folks developing web pages is more straight forward: If you wouldn't or couldn't put the information in an official letter to be signed by your commanding officer, don't make the information available on the web. Simple.

Are there infractions to my common sense rule? Whew! You bet! Microsoft, Netscape, some personal businesses, charitable organizations, not so charitable organizations, educational institutions, news and weather centers, etc. have a large web presence – compliments of DoD.

My personal list of questionable links found on government (or pseudo-government) sites include: Achoo.com (Internet Health Directory), Betty Crocker and the Nicole Brown Simpson Charitable Foundation.

Which leads me back to the areas of the Policy that could have been better thought out.

4.5.14. ... Only text or hyperlinked text shall be used to direct visitors to download sites. Graphics or logos depicting companies/products shall not appear on DoD web information services. Hummmm. I remember pinging on this one when the ALCOM 03595 was being birthed. My position hasn't changed.

If the agency has a legitimate association with the commercial company – such as an IDIQ contract, it should be permissible to use the company's commercial logo. By virtue of the fact the government has entered into a contract with them, I certainly hope we have some interest in their products.

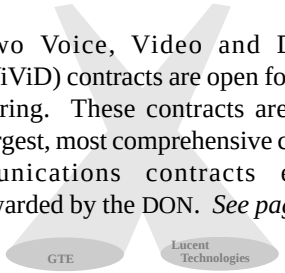
Besides – who have we fooled by using text instead of graphics to create our links? I realize a picture is worth a thousand words, but this doesn't make much sense.

Fellow web designers. Tighten up. Follow the rules. Police yourselves. If you don't, someone will do it for you.

Diane Hamblen

October Hot Spots

Two Voice, Video and Data (ViViD) contracts are open for ordering. These contracts are the largest, most comprehensive communications contracts ever awarded by the DON. *See page 4.*



Come to sunny San Diego for Connecting Technology Fall '97. Only this event brings together the most knowledgeable people driving the Navy IT Program. Admission if free! *See page 6.*

USSTRATCOM has a prescription for Information Assurance. Brig Gen Robert Behler, USAF tells us what it is. *Turn to page 7.*

While it's true that firewalls make access to some Internet resources more difficult (or impossible), they also protect your network resources from attack- **if** you install one and maintain it properly. *Read how to do that on page 10.*

Brig Gen Harry Raduege, USAF tells how the U.S. Central Command's communicators relocated and reestablished communications systems at breakneck speed while forces were consolidated due to terrorist threats. *Turn to page 13.*

Are you ready to order from the ViViD contracts? *See the CLIN lists beginning on page 29.*

Voice, Video and Data Contracts Awarded

-ViViD-

By David Mullins

The Naval Information Systems Management Center (NISMC), under the Navy IT Umbrella Program, awarded two Voice, Video and Data (ViViD) contracts on 29 July 1997. The ViViD contracts are the largest, most comprehensive communications contracts ever awarded by the DON. Cumulatively the contracts have a ceiling of $2.934 billion. These Indefinite Delivery, Indefinite Quantity (IDIQ) Contracts will provide the products and services to modernize, enhance, operate and maintain the Navy's Base Level Information Infrastructure (BLII), both afloat and ashore, as well as provide local access and usage (dial tone). They can also assist the Navy in its implementation of the IT-21 initiative.

Awards were made to two contractors, Lucent Technologies and GTE Government Systems Corporation. Lucent Technologies received a full award providing for modernization and local access and usage. The GTE ViViD contract is limited to modernization. The GTE award excludes local access and usage services.

The contracts have one base year with nine option years, for a 10-year ordering period and are available on a limited basis to other DoD agencies and the Coast Guard. They include a wide range of products and services to implement integrated voice, video and data solutions. ViViD provides products for OCONUS support including voice switches, routers, multiplexers and concentrators.

Today's information technology contract vehicles must serve two distinct categories of Navy customers:

- End users who require solutions that will allow them to meet organizational missions and increase productivity.
- Technology managers who must make the proper IT choices to satisfy end-user needs.

The challenges these customers face in meeting their information technology requirements include:

- Sorting through the avalanche of product information and ongoing standards battles to find optimum solutions for end-users.
- Fielding solutions that are interoperable at all levels (organization, Navy-wide, and ideally, DoD-wide) and meet the goal architectures of the BLII guidelines and IT-21.
- Meeting current budget constraints and minimizing the potential future cost of technology obsolescence.

The ViViD umbrella contracts have been designed to meet these challenges and satisfy the requirements of both the end-user and technology managers. These 10-year contracts have the scope of products and services necessary for the modernization of base-level communications from the organizational LAN up through campus-level backbone and transport systems, including cable plant.

In addition, ViViD provides data networking equipment (ViViD is intended to complement the PC-LAN+ contract, N68939-95-D-0018) and telephone switches; adjunct products necessary for a full network solution such as microwave; SONET transmission, network security and management products; and standard pierside fiber connectivity devices are included.

The ViViD awardees are offering market-leader products in each of the aforementioned categories, with the added value of extended warranties and technical support assistance for the life of the contract. Technology insertion will keep the hardware and software offerings current, and ensure that the contracts continue to provide all network elements necessary for a complete communications solution.

Paired with the product offerings on ViViD is a full communications life-cycle approach. Along with the contractor support services offered, this approach will provide design and requirements planning, project implementation and operation and maintenance of all or part of a network.

The contracts include lease and lease-to-own alternatives for procuring all hardware and software offered. This not only allows an IT manager to create an acquisition plan consistent with an Operations and Maintenance (O&M) budget, but also reduces risks inherent with new technology introductions. Customized outsourcing packages that can be provided through the ViViD contracts will combine the cost of amortizing equipment purchases across multiple years with the labor services needed to operate, maintain and meet end-users' functional requirements with this equipment into one monthly fee, or as otherwise negotiated. Using this fee-for-service offering, customers can obtain complete solutions (e.g., from point of presence to the desktop).

Products and Services Available

Products

Digital Switching Systems, including a full suite of products for both new and/or upgrades to existing switches (Lucent Definity and 5ESS, Nortel SL-1 and SL-100, AT&T G2, G3 and System 75, REDCOM IGX-2000,) are available. Switch offerings include some host nation and connections approved for overseas and afloat usage. Also available is a full suite of voice messaging products.

User Telephone Sets, including analog and ISDN capable devices.

SONET Multiplexers, supporting OC-3, OC-12 and OC-48 with input interface capabilities for a variety of transmission speeds and connectivity options are available. Sample OEMS include: Nortel S/DMS Transport Node OC-3, OC-12 and OC-48, Lucent DDM-2000 OC3, OC12 and FT-2000 OC-48, Alcatel 1603/12 OC-3 and OC-12 and the Alcatel 1648 OC-48.

Networking Products include routers, shared/switched hubs, ATM switches, multiplexers, remote access terminal servers, firewall systems, security products, Integrated Network Management Systems and microwave systems. Sample OEMS include: Cisco Systems, Bay Networks, XYPLEX, Cabletron, Secure Computing Corp., Timplex, Newbridge, FORE Systems and Osicom.

Uninterrupted Power Systems, and Power Generator. Sample OEMS include: American Power, Lorain, Triplite and Onan.

Local Access Services provide connectivity to the local public network and wide area networks and centrex services via Lucent's contract. Subcontractors include: Ameritech, Bell South, Pacific Bell, Southwestern Bell, US West Communications.

Cable and Apparatus provide an extensive capability for implementing copper and fiber cable plants. Sample OEMS include: Glenair, Chromatic Technologies, General Cable, Brand-Rex, Siecor, CSI, PLP, 3M, Systimax, Quazite, Osburn, Reltec, Anixter, Lucent, Varitronics, Superior, Amp Incorporated, Pyramid, Andrew Corp. and Reliable.

Shore-to-Ship Connectivity that will ease the pier-side connectivity of the ships to the base existing and future network is available. Component testing conducted by the Navy IT Umbrella Program will ensure products are interchangeable and compatible. A standard Fiber Optic connector receptacle utilizing 4 single mode and 4 multimode fibers with ST-type connectors will be used for this connection.

OCONUS support is provided.

Year 2000 compliance is a requirement for all hardware and software purchased under ViViD.

***Warranty* under these contracts is four-years for parts and labor for all hardware and software provided, including local travel. Also offered is the option to purchase an additional two-year extended warranty for hardware and software.**

Services

Labor Categories support a broad range of technical, administrative and operations services such as network architecture planning, migration planning, network modeling, site surveys, base cable plant planning, installation, integration, test and network operations and management. Sample labor categories include: program manager, project manager, engineer, junior engineer, senior engineer, network system programmer, computer system analyst, security specialist, configuration management specialist, system administrator, material coordinator, drafter, technical writer, word processor, laborer, carpenter, electrician, lineman, splicer and electronic technician. Labor intensive services are provided subject to the Davis Bacon Act.

Training includes courses for technical, operations and maintenance personnel.

Maintenance includes options for servicing switching systems, contractor-provided equipment, government owned equipment, and cable plants.

Procurement Options: The ViViD contracts offer the users the choice to purchase, lease-to-own or lease products that are procured in the modernization of their base information infrastructures, afloat and ashore. Additionally, the contracts' scope includes outsourcing some or all of the existing and future infrastructure and associated services.

Ordering products and/or services under ViViD is accomplished with a Standard Form 1449, DD 1155 or credit card. Credit card orders can be made telephonically, via e-mail, or as otherwise agreed to by the ViViD contractor and customer. If sending a credit card number over the network, use an encrypted or otherwise protected format. All SF-1449s and/or DD 1155s will be forwarded to the Navy IT Umbrella Program Central Order Management Office in Norfolk, VA:

Technical Specifications and Support Branch
Code N811.2
NCTAMS LANT
9625 Moffett Ave.
Norfolk, VA 23511-2784
Phone: (757) 445-1493 (DSN 565)
Fax: (757) 445-2103
E-mail:elaine_mcdaniel@ccmail.nctamslant.navy.mil

User Support: The ViViD contractors have established the following web sites and help desks to support the user by providing contractual and technical information, guidance, and assistance for all hardware, software and services on the contracts.

Lucent Technologies
Web Site: www.lucent.com/ViViD
Help Desk: 1-888-ViViD 4U
(1-888-848-4348)

GTE Government Systems
Web Site: www.vivid.gte.com
Help Desk: 1-888-483-8831

ViViD (Navy IT Umbrella Programs)
Web Site: www.chips.navy.mil/it
E-mail: vivid@smtp-gw.spawar.navy.mil

The Navy IT Umbrella Program office can also provide technical, contractual and ordering assistance. The Navy program office will ensure integration and interoperability of product offerings under ViViD. When practical, the PMO will test new products with other products on the ViViD contracts as well as equipment already in the Navy inventory. Questions regarding such tests should be directed to the Navy PMO.

This Navy IT Umbrella Program website has both complete contracts and all associated CLINs and SCLINs for ViViD.

SPAWAR Program Management Office: Under the direction of Nikki Isfahani, Head, Navy IT Umbrella Contracts Division, (SPAWAR PD15Q2) and David Mullins, ViViD Deputy Project Manager, the ViViD PMO will be relocated to San Diego, California. For information on the Umbrella or ▶

ViViD program, contact the PMO at (703) 602-4537, DSN 332-4537 or email vivid@ smtp-gw.spawar.navy.mil.

Why Use ViViD?

ViViD can be used as a means to procure IT products and services at prices competitive with other existing contract vehicles. More importantly, ViViD allows industry to partner with the Navy to fine-tune requirements and develop a complete solution for the migration of a network to the voice, video and data environment needed to support the demands of the BLII, DII guidelines and IT-21.

ViViD's design approach focuses on building for and seamlessly accommodating new technologies as they evolve to the point where incorporation makes financial sense to an individual organization or base. The ViViD awardees will be held to a standard of assuring interoperability among all equipments provided, **as well as with existing Navy-owned equipment.**

The ViViD awardees stand ready to assist technology managers and end users with design support, budgetary proposals to scope planned projects and help sorting through the information overload that is facing those involved in the planning and procurement of IT infrastructure and services. Vexing questions that IT professionals face, such as those below, can be resolved using the ViViD contracts.

- How will my voice network overlay onto a planned ATM backbone?
- Will the introduction of new standards such as MPOA (Multi-protocol over ATM) require the scrapping of existing network assets in order to realize its benefits?
- How and when will ATM to the desktop become a viable solution for my *power-users*?

ViViD has the scope, financing alternatives and industry partners to assist in managing the migration of an IT infrastructure through constantly changing shifts in priorities, funding, user growth and technology changes.

HOW TO USE ViViD

- Determine your requirements.
- For equipment, have a warranted contract officer issue a SF 1449 or DD 1155.
- For services, have a warranted contract officer:
  - Issue a statement of requirements to contractor and solicit proposal.
  - Negotiate if necessary.
  - Issue the order.
- Or for any requirement or assistance, call 703-602-4537 (DSN 332-4537) or e-mail vivid@smtp-gw.spawar.navy.mil
- For more information or a copy of the contract see: www.chips.navy.mil/it

About the Author: Mullins is the Deputy Project Manager for ViViD. He can be reached in the Umbrella Program Office, PD15Q2, at commercial (703) 602-4537, DSN 332. His e-mail address is mullinsd@nosc.mil or vivid@nosc.mil.

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• See the back cover for more details. •

First Name _____ Middle Initial _____

Last Name _____

Job Title _____

Agency/Command (Address Line 1) _____

Address Line 2 _____

Address Line 3 _____

City _____ State/Country _____ Zip Code _____

Commercial Phone Number _____

DSN Number _____

Fax Number _____

Email Address _____

Mail to: Bobbi Drexler • NCTAMS LANT • 9625 Moffett Ave • Norfolk, VA 23511-2784 • Fax (757) 445-2103; DSN 565

Prescription for Information Assurance: Vision, Commitment and Hard Work

By Brig Gen Robert F. Behler, USAF

Introduction. While commentary on the 1997 Quadrennial Defense Review (QDR) has focused on funding issues, that perspective has obscured the report's attention to changing mission priorities.

One new mission area received particular emphasis. Responding to the so-called *digital revolution*, the QDR called upon DoD to strengthen protection for the nation's information infrastructure. Such protection, formally termed Information Assurance (IA), is needed, the Review explained, because potential adversaries now have ready access to increasingly sophisticated, low-priced technology.

Since its establishment in 1992, United States Strategic Command (USSTRATCOM) has taken a determined and creative approach to IA. Protecting the information in the intelligence, planning and command and control systems arenas supporting the nation's strategic deterrent forces is a daily activity for the Command's personnel. The Command's accomplishments in IA have received two *Rowlett Awards* from the National Security Agency (NSA) for excellence in information security. This article will describe key steps in the development of USSTRATCOM's IA program and offer a road map for other agencies facing similar challenges.

Vision. Concern for security of information systems is in part a legacy from USSTRATCOM's predecessor, the Strategic Air Command (SAC). Because of the growing reliance on computer support for building and disseminating the Single Integrated Operational Plan during the 1970s and '80s, the SAC staff was particularly sensitive to threats against automated information systems. While SAC benefited from an inherent level of security offered by many command-unique systems, the increasing use of integrated systems and commercial products posed continual challenges. During a visit to USSTRATCOM in June 1994, Mr. Emmett Paige, Jr., Assistant Secretary of Defense for Command, Control, Communications and Intelligence, highlighted vulnerabilities identified in various information media. The flexibility of new technology, he noted, brought with it potential avenues for exploitation.

Responding to the issues raised by Mr. Paige, USSTRATCOM's Commander in Chief (USCINCSTRAT), Admiral Henry G. Chiles, Jr., directed a vulnerability assessment of the Command's information systems. The resulting assessment was conducted over a period of 18 months and included more than 20 systems. Representatives from NSA and the Defense Information Systems Agency (DISA) surveyed major information processing and transmission mediums, operating procedures and the physical environment. Consisting of three phases – systems studies, technical monitoring and in-depth evaluation – the assessment provided the Command with a comprehensive picture of its IA posture.

To give visibility and emphasis to IA for all members of the Command, USSTRATCOM's Flag Officers added Information Operations (IO) and its defensive IA subset to the list of the Command's goals and objectives. That goal stated that USSTRATCOM would *"lead the development of an integrated strategy for IO."* To emphasize the Command's commitment to IO and IA both programmatically and externally, USCINC-STRAT included, for the first time, IO on his Integrated Priority List for funding submitted to the Secretary of Defense.

Having given high visibility to IA, the Command chose to implement its IO and IA goals by formation of a colonel/Navy captain level working group and an IO Support Staff (IOSS). Those two organizations ensured USCINCSTRAT had the ability to carry out his IO responsibilities as defined in Chairman Joint Chiefs of Staff Instruction 3210.01, *Joint Information Warfare Policy.* The IOSS was comprised of experts from across the staff with knowledge of critical specialties such as electronic warfare, operations security, destruction and psychological operations. Responsibility for the defensive portion of the IOSS was assigned to an IA Officer.

To give form and substance to the activities of the IA Officer and to fix organizational responsibility, in March 1996 the new USCINCSTRAT, General Eugene E. Habiger, approved creation of an IA Division within the Command's Directorate for Command, ▶

Control, Communications, Computers and Intelligence (C4I) Systems. The IA Division became the first-of-its-kind in a joint command. Specifically formed to counter IO threats, the Division integrated information systems security disciplines into a single program. The IA Officer, along with the IO Officer in the Operations and Logistics Directorate, were the Command's focal points for the defensive and offensive portions of IO.

The IA Division developed a model of its mission centered on four subject areas and three tasks. The subject areas are people, processes, systems and facilities. The tasks are defined as *protect, detect and react*. The interaction of those tasks and subject areas form an endless loop of protecting information, detecting intrusions and correcting vulnerabilities to prevent future attacks.

★ **Commitment.** The commitment to IA requires a continuing and sustained effort. Emphasizing the central role of individuals in security, the C4I Systems Director placed the Command's computer training function into the IA Division. That move allowed IA to be integrated into in-house training courses, from specialized programming languages to user-orientation for the Command Management Local Area Network (CM LAN). Such training improves the security awareness and practices of Command personnel while keeping them current on the latest threats and solutions.

The IA Division also conducts monthly orientations for all newly assigned personnel. The Division also provides quarterly security update training to Information Systems Security Managers (ISSMs) and Information Systems Security Officers (ISSOs) throughout the Command. The ISSOs, in turn, brief all Command personnel on IA security topics every quarter. Finally, the Division publishes an in-house security newsletter, *Security Focus*, and uses an internal web page to heighten the Command's IA awareness. Those forums allow the Division to disseminate information derived from diverse DoD, commercial and academic sources.

The Command has actively promoted the interchange of IA ideas and initiatives. In June 1993, USSTRATCOM organized and hosted a four-day workshop involving computer security personnel from across the federal government. More than 150 personnel attended from 45 agencies. Similarly, in 1995 USSTRATCOM held a firewall exposition and training symposium which attracted more than two dozen firewall vendors and provided training to USSTRATCOM security personnel and systems administrators. The following year, the IA Division organized *Information Warfare Awareness Days* to provide two days of intense training for the entire staff.

For the first time, senior representatives from the FBI, the Office of the Secretary of Defense, Joint Staff, NSA, DISA and the National Defense University came together to share ideas, concerns and initiatives with the Command. All USSTRATCOM Flag Officers were in attendance for six hours of IA training.

General Habiger demonstrated his personal commitment by narrating a video presentation on IA. This video is now part of the orientation for all newcomers and gives the subject solid credibility.

To meet information threats head-on, the IA Division built a **911** function in the USSTRATCOM Computer Emergency Response Team (STRATCERT). The first-ever CERT in a joint command, STRATCERT includes a 24-hour emergency response center to detect intrusions into automated information systems and to respond to reports of malicious code and viruses. Applying centralized control and decentralized execution methodology, STRATCERT has trained more than 100 ISSOs who can be activated to assist the USSTRATCOM Senior and Support Battle Staff and the IOSS.

The IA Division also created a C4I Security Analysis Team to provide vulnerability and policy compliance assessments of the Command's unclassified through Top Secret systems. Equipped to emulate hacker threats, the team obtains software tools from commercial services and Internet hacker bulletin boards to test and demonstrate vulnerabilities - occasionally with eye-opening results.

The positive results obtained through the assessment process enabled the Division to obtain funding to build an Information Assurance Operations Center to house both the STRATCERT and the Security Analysis Team.

★ **Hard Work.** Inserting IA considerations into operational exercises ensures an activist approach. Exercise *Bulwark Bronze 95* saw the first incorporation of an IA Master Scenario Event List (MSEL) into a large scale training exercise. Detailed MSELs provided senior staff with their first analysis of the Command's IA posture based on operational considerations and tested the Command's ability to operate within an unpredictable and hostile IA environment.

For exercise *Global Guardian 97*, the IA Division built over 70 scenario injects including both on-line and physical attacks. The exercise included employing an integrated team from the Air Force Information Warfare Center and the Joint Command and Control Warfare Center to conduct penetrations. The team applied covert and overt adversary intrusion techniques to attack the Command's critical C4I infrastructure, facilities, people and processes. During the exercise, STRATCERT demonstrated its ability to thwart both

structured and unstructured attacks.

To maintain a strong security posture, the C4I Security Analysis Team created automated tools to standardize and simplify the risk-analysis process. Those tools gave the Command consistent metrics for evaluating risk and transformed the on-going assessment of system security from a static, paper-driven process to a dynamic, on-line demonstration of vulnerabilities.

That dynamic process, called *System Profiling*, augmented the risk-analysis process by providing a near real-time and continuous analysis of automated information systems security functions. System Profiling also measures the effectiveness of security features when integrated with computer operating systems and commercial and government applications programs. Further, consistency in evaluation of USSTRATCOM systems comes from developing and following contingency and security plans and the associated library of Security Test and Evaluation scenarios. Those scenarios also assist in designing security into new systems.

The IA Division is also responsible for the integration and engineering of electrical and environmental systems supporting C4I facilities. The Division ensures that security concerns are part of site preparation, power and air handling installations, intrusion and detection systems and planning for disaster response and recovery. These efforts ensure that the physical security environment receives that same attention given to the *virtual* security environment.

Results and Future Directions. Building on the strength of its IA initiatives, USSTRATCOM is helping to shape IA policy for the DoD. USSTRATCOM was the first joint command to have voting membership on both the DoD Computer Emergency Response Working Group and the DoD IA Education, Training, Awareness and Professionalism Working Group. Through both forums, the Command's accomplishments and experiences are improving IA activities throughout DoD. USSTRATCOM's accomplishments were also recognized when the Command's Director for C4I Systems was asked to brief the Presidential Commission on Critical Infrastructure Protection. After receiving that briefing, the Commission's members asked for a copy of the STRATCERT concept of operations.

In 1996, the Command further energized its program to integrate backbone and host-base connectivity while improving security of both with firewalls, intrusion detection tools and standardized management and response procedures. This expanded vision for protecting the Command's information infrastructure has injected security into the planning cycle at the earliest point possible. The division also acquired funding to develop a Goal Security Architecture, to engineer and design security into future systems. Additionally, USSTRATCOM is advocating an IA initiative through a DoD Advanced Concepts Technology Demonstration project. That project seeks to integrate and automate computer network intrusion detection, correlation and warning capabilities

The accomplishments of USSTRATCOM's IA Division have demonstrated the progress that can be made in the challenging arena of information security. Commitment of resources and expertise was essential to those accomplishments. The combination of skills and Command focus provided the motivation and involvement of personnel across the Command to support IA objectives. Continuation of these efforts will lead to even greater successes and will serve as a model for other DoD agencies to follow.

For more details on the USSTRATCOM IA program, please contact Mr. Jim Muckey, IA division chief, at muckeyj@j67.stratcom.af.mil or (402) 294-4411, DSN 271.

About the Author: Brig. Gen. Robert F. Behler is Director for C4I Systems, United States Strategic Command, Offutt AFB, NE. He has served in a variety of command assignments in Strategic Air Command, Military Airlift Command, Air Combat Command and Air Force Systems Command. He is a command pilot with over 5,000 hours of flying time in 50 different aircraft including eight foreign aircraft. Gen. Behler has flown the world's fastest and the world's slowest airplane.

Learning to Live with a Firewall

*While it's true that firewalls make access to some Internet resources more difficult (or impossible), they also protect your network resources from attack- **if** you install one and maintain it properly. As we found out, that can be harder than it looks.*

By David Rook

At the risk of making my boss cringe with yet another of my rash predictions... "In the next three years, we'll see a military security breach perpetrated on the Internet/Milnet that causes the same level of damage as the infamous Johnny Walker case."

Why? It's simple. Our networks are being used for ever more important communications, and we aren't giving them the protection they deserve. To prove my point, one (anonymous) Pentagon source indicated that he thought firewalls were entirely unnecessary. "They just get in the way."

Some time ago a team of firewall installers from the NISE EAST visited NCTAMS LANT. Their first visit was a *survey* to see if we needed a firewall and to get some idea of what changes might be required when we installed it. In retrospect, the team was too concerned with documenting our *original* configuration. The status quo proved to be irrelevant because we ended up changing our network radically during the weeks the team was installing the firewall. This actually turned out to be good news, because it gave us a chance to simplify our network topology. Since that time, tracing and fixing network problems has definitely been easier.

Although we knew it wouldn't be *free*, installing the firewall cost more than we anticipated. The original plan was for SPAWAR PMW 161 (NISE EAST's sponsor) to provide the inner and outer routers as well as the bastion host. Budget cuts and policy changes at SPAWAR forced us to pay for one of the routers. It was probably a good thing because it gave us the opportunity to simplify our network topology. However, it also was about $20,000 we hadn't planned on spending.

That amount might be difficult for some organizations to raise on short notice. We might have avoided this expense if we'd depended on DISA to allow us to use their POP router as part of our firewall (the outer router). However, past experience led us to believe that level of cooperation was an unrealistic expectation. I also understand their policy, that backbone routers shouldn't do access control, but it does lead to more expensive solutions.

Another surprise was how long it took to get the connectivity issues settled. It took a week to find the person responsible for advertising our new class "C" network to the rest of the world's routers (publishing our autonomous system ID) . Because the NISE EAST team couldn't move forward with the installation until this was done, it set the project back by that much.

Once the firewall was in place and operational, we got a first-hand opportunity to see how it was configured. Unfortunately, the configuration process for the two CISCO routers and TIS Gauntlet firewall was far more complex than I'd expected. There was no automation involved; you edit a table or a command script and hope you type things correctly. There's no support for cross-checks, so your security policy is consistently applied to inner router, outer router and firewall.

After the firewall was installed, we discovered the policy being enforced was not the security policy we'd stated (verbally) to the installers. The installers had (mistakenly) decided that our internal department networks needed to be protected from each other and had produced rules and filters to do that. Because these rules did not meet our actual (now written!) security policy, we've removed these restrictions.

I've seen systems where the router configurations are under the control of a Master Control Program (MCP) that runs on the bastion host and provides a GUI to control the firewall. This approach seems more appropriate to the common situation where a firewall administrator is usually a part-time person who may be called upon to perform very complex and difficult firewall reconfiguration tasks on a moment's notice. The problem with the MCP approach is that it's software intensive and very hardware and software version specific. It's appropriate for a situation where a central body exercises configuration control over a large number of firewall installations that can all be administered using the same MCP approach. That's unfortunate, because the current configuration method is too hard for the average person.

The issue is clouded more by the fact that software vendors want to get into the router configuration business and router makers want to get into the firewall business. Add to that the fact that new versions of firewall and router software are coming out about every 4-6 months and you have a mess, with no end in sight.

The on-site training provided by the installation team was adequate for general system maintenance, but did not meet our needs in terms of the level required to reconfigure the routers and the bastion host to respond to an emerging threat condition. As a minimun, the firewall administrators will need to attend an introductory routing course, *Introduction to CISCO Router Configuration* in our case, since we used CISCO 4500 routers.

If you have a complex multi-protocol network the *Advanced CISCO Router Configuration* class may also be helpful. Familiarity with some form of Unix, preferably HPUX, is also a prerequisite since the bastion host runs on the TAC-4 HP workstation.

(Late breaking news... the 712/60 TAC-4 platform is no longer available. It looks like Mr. Murphy left us no way to get a *backup* machine similar to the one we have now.)

Timing. There is no good time to install a firewall. If you need one, just do it. We postponed the installation several times, but were no better prepared for the final event. You need to be prepared, but sometimes the only way to get folks' attention is to set a schedule date and force everyone to stick to it. It's always going to cause some disruption (unless you have no network/Internet now.

Reading and interpreting the logs proved to be a real challenge. That's why some DoD activities never even look at them. But, if you

skip them because of the pain involved, you'll never see the signs of an impending attack. Some sites who should know better let the logs rotate into the bit-bucket. Tempting. But I couldn't in good conscience follow suit, even though it meant looking at 12,000 to 20,000 lines of logs every day. I quickly decided it would be more productive to write some programs to reduce the logs to a manageable size.

My programs operate on the principle of *exception*. Those events which are known to be *normal* and/or *safe*, are saved, but set aside in a file which can be ignored. The exceptions are passed by e-mail to the firewall admin team for review. After doing the scrub, only about .5 percent of the log turns out to still be interesting. Everything, both interesting and ordinary, is zipped and saved to disk for one year.

Speaking of logs, you should - no, you **must** plan what types of events you intend to log. As we found out, logging the details of popular protocols (like http/WWW) may be unwise. We noticed this when the bastion host couldn't keep up with the WWW traffic, resulting in some very unhappy users. It turned out we were logging the starting and stopping of every protocol (proxy) event as well as the contents of some (http). When the admin team looked at how we intended to use the logs, we decided there was much more detail than we needed. NISE EAST was kind enough to modify the source code and recompile the Gauntlet software to reduce the logging detail. It worked better, but we still have incomplete lines in our logs, leading me to believe the syslog process has problems.

How well does the firewall perform? At first users complained that the firewall was slowing things down. What we found was that other factors were always at fault, not the firewall itself. Now that things have settled down the users are (mostly) happy, and the firewall seems to be able to process data rapidly. How rapidly? Well, I downloaded Service Pack 3 for NT 4.0 from Microsoft at 1.5 Mbit per second. Local FTP transfers run through the firewall at speeds of 3 Mbit per second. That's not too bad for a shared 10 Mbit Ethernet through a very modestly powered bastion host.

One final plea to current and potential firewall administrators: Make sure you have a *written* network security policy. Make sure you *understand* your security policy and how the firewall enforces it. Don't trust someone else to do the job for you. For one thing, your security policy will probably change over time. For another, the kind and probably the level of threat to your networks will change. You must be able to reconfigure it quickly and correctly if you're going to escape being battered by hostile forces. Some hostiles are military professionals in the service of sworn enemies. Some are children. If your system goes down or your data is compromised,which would you rather tell your boss:

- They got past the best defenses we could muster.
- It's my own fault, I left our systems wide open.

Beware of the dark side.

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A Language Collector Comments on:

Java, Perl & Python

By David Rook

Some folks collect baseball cards; I collect computer languages. If it's out there, I've *got* to learn it. I don't always keep them, but I like the challenge. Since I needed to write programs to condense the firewall logs into human-friendly documents, I had a good excuse to *collect* a few more languages.

Java has lots of hype and some interesting features. Will it change the world? Probably not, but the potential is there. What makes Java interesting? Well, to me it's the reincarnation of two old friends: pseudocode and a universal API. For those who can remember back that far, we had these in 1978 when UCSD Pascal came out. It was a character based 80x24 screen and was interpreted briskly :-) on my Apple II with 64 KB of RAM and dual 180 KB floppies. But, the key is the exact same object code ran on machines from Apple, Radio Shack, DEC and Western Digital even though they used completely different microprocessors. This was a major breakthrough (20 years ago). However, it had two drawbacks: It didn't run as fast as native code and Pascal wasn't a mainstream language. The wrath of Kahn (Turbo Pascal 1.0 and its offspring) eventually exterminated UCSD Pascal in favor of super-fast native code compilers for the x86 family. C'est la vie.

Today, Java is making headlines because it can run (interpreted) on multiple platforms. It also has a universal *application program interface* since some browsers which support Java can run on more than one type of hardware. Thus it offers shrink-wrapped object code, the Holy Grail of non-Intel hardware manufacturers.

What's wrong with Java? As with any interpreted language, some people take issue with the speed of execution. It's fast enough for some and not fast enough for others. One solution, pioneered by UCSD Pascal, is to craft a silicon-powered native-Java CPU. Sun is doing just that.

What's Java like to program? On the outside, it looks like C++, though simplified by the removal of various components deemed either too complex or unnecessary. Pointer arithmetic is gone; header files are history; templates were terminated. Multiple-dimension arrays have vanished to another dimension, and multiple inheritance is dead. There are work-arounds for all this, but the porting process for C/C++ to Java is non-trivial. The good news is that it's probably worth it. In spite of some known security problems with Java, it's simpler, safer and more portable to write Java than to do the equivalent with cgi-bin programs. For icing on the cake, Java has an extensive library of GUI objects (the Abstract Widget Toolset) which can handle all of the user interface requirements a typical WWW programmer needs. To go beyond the typical, just write your own widgets, extending the library objects any way you want.

Java does some things safer than C. References to uninitialized variables are found, and null-pointer references are prevented. It checks array indexes at run-time and catches out-of-bounds references. Java does automatic memory allocation (garbage collection), and this by itself makes code simpler and safer. Exception handling is similar to C++.

An interesting point for portability is that Java defines the number of bits in various numeric types. A *byte* has 8 bits. A *short* has 16 bits. An *int* has 32 bits. A *long* has 64 bits. This is true no matter how the CPU chip works internally. C programmers will note this is in stark contrast to the chaos normally seen in this area. Gulliver would be happy to note that *endian* ▶

problems are still present, even in Java, as Intel and Motorola/ SPARC continue to use a different bit order.

One disappointment is that Java version 1.1 is significantly different from 1.0. Literally hundreds of methods (functions) used in 1.0 are now *deprecated*, i.e. they still work, but may be dropped entirely in a future version. Java 1.1 is new enough that it's still buggy and there's a lack of tools. At present, mainstream browsers (Netscape 3.0, I.E. 3.0) won't handle 1.1's new features.

Microsoft has a Java compiler (J++) that's moderately priced and modeled on their very successful Integrated Development Environment. It's quite fast and has a debugger to die for.

Other Java tools aren't as polished. Sun's Java compiler for NT is a command-line version which won't even allow you to redirect the output (error list) into a file. On the other hand... it's free. Documentation is (for a change) present and voluminous. An introductory book may help you get started, but JavaSoft's jdk1.1.3 documentation has hundreds of (runnable) examples. You'll need that, and if you're not familiar with C, you'll definitely need the Java

Language Reference. Unfortunately, the 1.1 Language Reference is in the works, and you'll have to settle for 1.0. Look for it on the web, starting at http://www.javasoft.com.

Java's similarity to C++ is widely viewed as an advantage outside DoD, and perhaps even inside DoD now that the Ada mandate has passed into oblivion. A more serious issue is how well Java can be integrated into other environments. Java may have difficulty breaking out of the mold of *WWW applet language* into something bigger. It also risks being improved out of existence, much like the fate of UCSD Pascal. Vendors who make subsets/supersets of JAVA may end up hurting its portability, which is probably its biggest asset. The *100 percent Pure JAVA* campaign by Sun Microsystems is an attempt to head that problem off at the pass. Time will tell if they succeed. I hope they do.

Perl has been rumored to stand for *Pathologically Eclectic Rubbish Lister*. I agree. Even after years of working with it, I don't feel comfortable writing Perl without the most current *Camel Book* [Programming Perl by Wall & Schwartz, O'Reilly & Assoc] by my side. For whatever reason, I just can't get comfortable. It's a little like C, but not enough. For instance, in Perl you can write "exit if $x ne 'continue'" or you can write a more C-like if ($x ne 'continue') {exit} Unfortunately, you can use both styles in the same program, resulting in confused readers. Perl has different operators for string comparison and number comparison, even though it will (invisibly) convert a string to a number. If I only wrote Perl, this might not be a problem, but I tend to use a number of different tools, and switching into Perl mode continues to be a difficult transition.

Fortunately, I've found an able replacement for those system administration tasks I previously would have written in Perl. So, without throwing more stones at Perl, lets go on to Python.

Python. From the outside Python looks like C++ and has many OOP (object oriented programming) features, but without much of the complexity of C++.

For instance, Python is a *self-typed* language. Assign a string to a variable and the variable is assigned storage as a string. If you later use the variable in an arithmetic expression, you get a compile error. You also get a compile-time error if you try to do arithmetic with uninitialized variables. The reason is that uninitialized variables don't have a type, and some data types can't participate in arithmetic expressions.

Once you stop using a variable, it gets reclaimed (garbage collected) automatically. This is important because C++ programmers tend to devote a large portion of code (10 to 20 percent) to preparation for and execution of the memory allocation/reclamation process. While C++ makes the setup/tear down process easier than with C, Python makes it unnecessary.

Grab-bag of Python features:

- Though the syntax is a little different, Python has classes and inheritance very much like C++. This gives it both power and brevity of expression.
- The special syntax for list (array) operations is both simple and powerful.
- Integers are like C long ints.
- Unlike most languages, Python's long integers have unlimited size. Want to count the national debt in pennies? No problem in Python. Floating point in Python is handled like a C double.
- Dictionaries are associative arrays that allow objects to be stored and fetched by key.
- Python has exception handling much like the latest C++.

While none of these features are really earth-shaking, the concise, consistent architecture is a welcome relief.

Another feature is that Python is both compiled and interpreted. When you run a Python program it's automatically compiled to *pycode* (aka pseudocode, like Java's bytecode) and then interpreted. Pycode generally runs about 100 times slower than native code, but now we get to another interesting feature. It's relatively easy to mix and match Pycode and regular C or C++. The typical scenario is to develop in Python then convert modules that don't run as fast as you want to C or C++. C can be called from Python and vice versa!

The ability to support RAD (Rapid Application Development) with Python is the key to its success. The most concise description of Python I can think of is, "Python is executable pseudo-code". This is exactly what I wanted for my human-friendly firewall logs.

It's impossible for me to detail all the neat things I've found in Python in a page or so. If you're interested in programming (and you must be or you wouldn't still be reading this...) check it out for yourself at http://www.python.org. You can find WIN95, WINNT, Unix and other flavors of Python interpreters there.

The 881 page *Programming Python* by Mark Lutz (O'Reilly & Associates Inc.) provides a good tutorial on Python, but to get the true flavor of the language you need to see some real-world source code. Fortunately, the Python source code (in a combination of Python and C) is available free on the Internet.

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Shifting Communications in the Saudi Sands

This is the story of how the U.S. Central Command's communicators relocated and reestablished communications systems at breakneck speed while forces were consolidated due to terrorist threats.

By Brig Gen Harry D. Raduege, Jr., USAF
With Lt Col Roland LeSieur, USAF & Maj Michael Gasapo, USMC

On 25 June 1996, the lives of 19 United States military personnel were lost in a terrorist attack on Khobar Towers in Dhahran, Kingdom of Saudi Arabia (KSA). This attack began the planning phase of Operation DESERT FOCUS, which eventually led to the relocation of approximately 6,000 people within KSA and improved the Command's ability to protect lives and assets stationed throughout Southwest Asia (SWA).

This article describes USCENTCOM's response, from a communications system perspective, to the U.S. Secretary of Defense direction to relocate military forces and civilian organizations within KSA. Operation DESERT FOCUS relocated people, aircraft and equipment to three primary sites in KSA: Eskan Village, Riyadh; Prince Sultan Air Base (PSAB), Al Kharj; and Eagletown/ Site 12, Dhahran. The monumental effort to provide increased security for Coalition forces within the KSA would not have been possible without the superb support and timely decision making by numerous elements of our Saudi civilian and military counterparts. The Ministry of Defense and Aviation and the Royal Saudi Air Force played key roles in addressing the many issues involved in consolidating forces and supporting the relocation through financial and Assistance-in-Kind initiatives. This unprecedented cooperation has led directly to more secure facilities and ensures the highest level of force protection for the ongoing operations in SWA.

While a myriad of warfighting disciplines helped to make Operation DESERT FOCUS a success, we'll focus on the command and control communications systems and will describe the critical actions set forth by the USCENTCOM Directorate of Command and Control, Communications and Computer Systems (CCJ6).

Operation Desert Focus: The Planning Phase

On 8 July 1996, General J. H. Binford Peay III, USCINCCENT, dispatched a Tiger Team headed by the Command's Deputy Inspector General with representatives from Operations (CCJ3), Logistics (CCJ4/7) and CCJ6. The team deployed to Eskan Village, KSA after receiving a situation assessment from CCJ3 concerning the status of events in the KSA and USCINCCENT's intent.

The team was chartered to assist JTF-SWA in planning their movement from the RSAF building in the center of Riyadh to several more protected villas at Eskan Village, on the outskirts of Riyadh. The CCJ6 representative, Lieutenant Colonel Michael Emery, assisted Colonel Bud Bell, the JTF-SWA/J6, in relocating critical command and control links required to support daily flight operations, and ensured that all theater C4 assets and services were available to support the JTF-SWA relocation. It was also critical that on-going Operation SOUTHERN WATCH activities were not impacted in any way.

Upon arrival in KSA, the Tiger Team immediately assessed the situation and met with their counterparts on the JTF-SWA staff to begin planning and coordination. The CCJ6 representatives quickly convened a series of meetings at the U.S. Military Training Mission (USMTM) Compound in Riyadh. The meetings fused the expertise of USCENTCOM, U.S. Air Forces Central Command (CENTAF); U.S. Army Forces Central Command-Saudi Arabia, (ARCENT-SA); the 54th Signal Battalion; DISA Forward; Theater Communications Management Cell (TCMC); and the 4409th Communications Flight. A plan was quickly formulated to systematically relocate critical command and control systems without degrading support to ongoing operations. Fortuitously, the CCJ6 had recently completed a *500 Day Plan for Improving USCENTCOM's C4 Warfighting Capability – May 1996 through August 1997*. This plan became the nucleus for the rapid changes that would soon be taking place.

JTF-SWA's initial primary C2 tasks were to conduct a site survey at Eskan to determine the best location for their new complex, finalize the staff relocation timeline and develop rough order of magnitude (ROM) cost estimates for relocating C4 assets from the USMTM Compound in downtown Riyadh. Additionally, in conjunction with USCENTCOM HQ, a C4 transition plan covering all tactical C4 systems (Ground Mobile Forces, voice, messaging and data capabilities) needed to be developed to simultaneously support the relocation and ongoing missions of Operation SOUTHERN WATCH. The intent of Major General Kurt Anderson, the JTF-SWA Commander, was to perform a hot cutover with little or no impact on the JTF's command and control of flying operations.

The 54th Signal Battalion was tasked to perform a site survey for an Interim Telecommunications Facility (TCF) at Eskan Village, with support from the Army Information Systems Command's engineers. They were also required to develop ROM cost estimates for the TCF equipment and cabling, a 45MB microwave installation, and, at the same time, begin site preparation for a mini-TCF, which would be installed to accommodate the fast-paced relocation timeline until the Interim TCF could be completed. Working hand-in-hand with the 54th, Captain Mary Dixon, 335th Signal Command, was one of the primary engineers responsible for the strategic TCF and telephone switch reconfigurations and orchestrated the complex, ever-changing, circuit/switch cut-over plans. ▶

On 13 July 1996, four days after arrival, the Tiger Team outbriefed the JTF-SWA Command Group and all representatives, except Colonel Michael Emery, returned to CONUS. He remained at Eskan Village to continue relocation coordination and planning activities with JTF SWA and the 54th Signal Battalion, the primary SWA Defense Information Infrastructure (DII) provider within the Area of Responsibility (AOR). Colonel Emery, the CCJ6 Forward, monitored the relocation and kept the CCJ6 at MacDill AFB, FL apprised of current and future activities and any impending problems.

The CCJ6 had overall responsibility for all tactical C4 networks transitioning to support JTF-SWA and other CINCCENT-directed Force Protection initiatives. Additionally, a communications staff officer deployed to Riyadh to aid in standing up a Friendly Forces Coordination Cell (F2C2), and to coordinate plans and cost estimates of all relocation activities with the Government of Saudi Arabia . As the F2C2/J6, Major Roland LeSieur's primary tasks involved coordinating Eskan Village, PSAB and Site 12 projects with the engineers from USCENTCOM and the Army Corps of Engineers, consolidating C4 projects for inclusion in the Corps of Engineers specifications (which were forwarded to the Saudis for design and funding), and coordinating numerous communications requests to the Saudis.

The F2C2 and their counterparts on the MODA and RSAF staffs resolved hundreds of issues – communications assets and their supporting staffs relocations, access to facilities and microwave towers for installing new communications equipment, satellite system landing rights, and siting critical air traffic control systems – to name a few.

CENTAF's primary objective was to coordinate deployment of additional tactical C4 assets to the theater to support JTF-SWA's relocation and hot-cutover of critical C2 circuits while still conducting Operation SOUTHERN WATCH. Figure 1 shows the communications architecture prior to the relocation of forces.

Figure 1

MAJOR C4 LOCATIONS PRIOR TO OPERATION DESERT FOCUS - JULY 1996

Operation Desert Focus: The Execution Phase

In order to meet CINCCENT's directed timelines for relocation, JTF-SWA began site preparation for all villas at Eskan Village on 29 July 1996. Colonel Tom Verbeck had now arrived for a 90-day tour as the JTF-SWA/J6. The JTF-SWA/J6 staff planned the staggered relocation of JTF-SWA operational and staff functions, focusing on the rapid reactivation of the Air Combat Operations Center (ACOC) at Eskan Village. Transition of tactical C4 networks also began. This effort required 93 deployed personnel from the 3rd Combat Communications Group, 609th ACOMS, Air National Guard elements and the 4409th Support Group. The major equipment transitioned included TSC-100 satellite terminals with QRSA antennas, a TTC-39 telephone switch, TRC-170 tropo radio, TSQ-111 tech control van and GRC-239 TSSR microwave radios.

Simultaneously, CENTAF's newly developed Air Defense System Integrator, which replaced the Rapidly Deployable Integrated Command and Control System, was integrated with the Kuwaiti Low Altitude Surveillance System - an aerostat with radar - and significantly improved the theater early-warning network. This also reduced the strain on the Airborne Warning and Control System (AWACS) crews. Circuits that supported the air picture and Air Tasking Order were the first to be cut-over. The relocation of JTF-SWA operations to Eskan Village achieved initial operational capability on 13 August 1996, only 17 days after the effort began!

The crux of the strategic communications infrastructure restructuring fell upon the 54th Signal Battalion, under the command of Lieutenant Colonel Mark Bowman. The 54th was responsible for activating a 45Mbps microwave link from the strategic Defense Information Systems Network (DISN) entry point on the Riyadh AT&T compound to Eskan Village, planning and executing numerous cable projects within Eskan Village and rehoming the necessary circuits to all new facilities. Also charged with supporting the noncombatant agencies - USMTM and the Office of the Program Manager, Saudi Arabia National Guard - the 54th Signal Battalion ensured that these organizations' military members, and their dependent family members, received telecommunications support for their new housing facilities in the Al Yamamah Compound.

Also during this phase, CINCCENT directed relocation of all facilities at the Riyadh USMTM Compound to Eskan Village. All SWA DII C4 facilities operated and maintained by the 54th Signal Battalion (e.g., TCF, SL-100 telephone switch, telecommunications center (TCC), and Battalion/Company functions) had to be moved. This also applied to the 54th Signal Battalion C4 facilities in Dhahran, which were directed to relocate to a more secure location at Site 12, outside Dhahran.

The 38th Engineering Installation Group (EIG) began support of Operation DESERT FOCUS in August 1996. The 38th EIG deployed a fact-finding team to determine C4 require-

ments at PSAB and Eskan Village. Numerous communications systems and interconnections required immediate movement to new locations and required a major response from the engineering and installation community. The 38th EIG also provided engineering and installation teams to install LAN capability for all operations being relocated to PSAB and all command and support activities at Eskan Village.

The 38th EIG's fact-finding mission went well beyond its initial purpose - providing on-site engineering for many of the needed systems - which expedited the relocation and installation of C4 systems within new facilities. The team provided technical solution and cost estimates for Eskan Village without the existence of detailed communication record drawings. This included a LAN for 171 buildings, a complete cellular phone network for over 100 users, a Base Network Control Center and a Giant Voice public address system. Over 100 manholes, 160,000 feet of cable and 12,000 circuits were involved at Eskan Village alone.

This process was repeated at PSAB. In addition, the PSAB installation required a complete fiber optic cable layout for a new *tent city* that was developed in just three days. This allowed follow-on supply and installation phases to proceed well ahead of the ambitious operations schedule. Beyond the basic needs of the new facility, the team assisted with several acute situations. These included moving and reburying cable damaged by unexpected vehicle traffic. Also, a special Project Peace Shield cellular telephone installation, for use between the U.S. forces and their Saudi counterparts, ensured proper coordination of movements between facilities. Early presence of these team members enhanced joint leadership capabilities in making the right decisions to satisfy the C4 requirements for both Eskan Village and Prince Sultan Air Base.

CENTAF deployed the 3rd Combat Communications Group's assets to the theater in support of JTF-SWA's relocation to Eskan Village, and the 5th Combat Communications Group had primary responsibility for the 4404th Wing beddown at PSAB. Additionally, the 3rd Combat Communications Group also activated super high frequency (SHF) ground mobile forces (GMF) terminals and a TTC-39 telephone switch at Eskan Village. CENTAF assets located at King Abdul Aziz Air Base, Dhahran, were directed to relocate to PSAB while the 4409th Wing aircraft and base support functions at Riyadh Air Base began relocating to Eskan Village and PSAB.

This phase also required the evacuation of all C4 facilities from the Riyadh USMTM TCF, site preparation for the SL-100 telephone switch and its relocation to Eskan Village, and installation of a 600 pair cable between the SL-100 and the SL-1 switches. Concurrently, planning for the Dhahran TCF, TCC, SL-100 and the ALASCOM strategic satellite earth terminal relocation to Site 12 and relocating the 550th Signal Company living quarters from the Dhahran USMTM Complex to Eagletown began.

Early September 1996 brought new challenges which further complicated efforts to relocate forces within Saudi Arabia. Iraqi forces precipitated a regional crisis with their aggressive acts against the Kurdish minorities in northern Iraq: Operation DESERT STRIKE was initiated. A rapid buildup of U.S. forces and the precision application of military power necessary to deter Iraqi aggression forced the collective AOR communications support personnel to focus on ensuring communication systems, still in transition, were *hot* and available to support strike missions. Coping flawlessly with these new challenges, the collective communications support expertise *on the ground*, in the rear at USCENTCOM and at NAVCENT-Forward (Bahrain) ensured the end result was the right C4 support, at the right time.

PSAB soon became the next hurdle for an already stretched-to-the-limit communications support force of the 5th Combat Communications Group. Tactical communicators and their assets deployed to PSAB, as network restructuring was accomplished in phases.

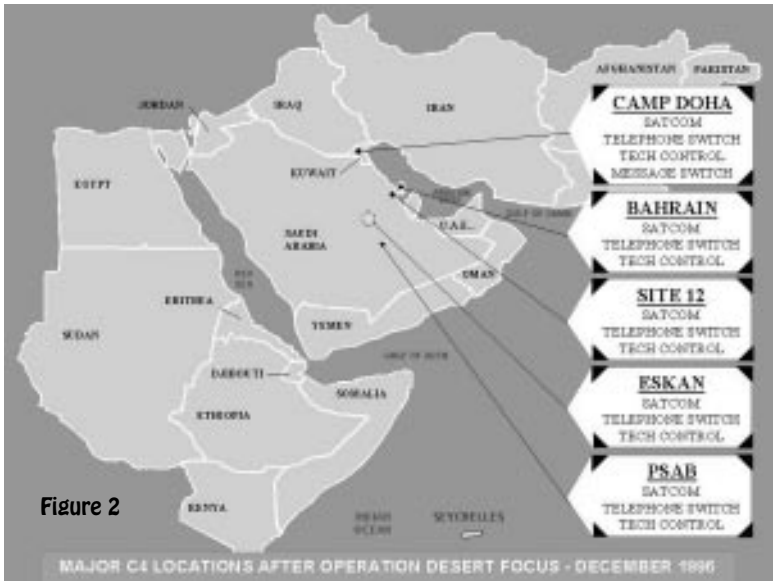

Figure 2
MAJOR C4 LOCATIONS AFTER OPERATION DESERT FOCUS - DECEMBER 1996

The physical placement of critical, communications-dependent facilities on PSAB, such as the Wing Operations Center, was undecided for weeks, so communications assets could not be permanently sited. Finally, optimum physical locations for all PSAB facilities were identified and support infrastructure was planned and installed for the communications-intensive operational facilities. Figure 2 depicts the communications configuration after the major Operation DESERT FOCUS relocation actions had been completed.

By December 1996 - only five months after the Khobar Towers bombing - most directed relocations were complete and the effort to coordinate and consolidate the majority of the communications systems relocations was well underway. The new architecture brought with it a stark realization that intra- and inter-theater bandwidth, currently provided almost exclusively by tactical military assets, needed a tremendous increase in capacity. ▶

CCJ6 and DISA-CENT, under the command of Colonel Mike Griffith, immediately began exhaustive planning to implement the Commercial Satellite Communications Initiative (CSCI) to address bandwidth shortfalls. This initiative provides large capacity communications pipes that can support burgeoning requirements for voice, data, video and imagery – Information Superiority that the modern warfighter requires to conduct high tempo operations.

Post-Operation Desert Focus: Future Improvements

The CSCI, analogous to the Civil Reserve Aircraft Fleet, will provide day-to-day communications support as well as surge capacity when required. However, this self-sustaining, fee-for-service program requires up-front host nation approval for a satellite transmission system capable of operating in both the C and Ku frequency bands. Using leased transponders, CSCI will support day-to-day, crisis, contingency and humanitarian relief operations.

Commercial communications requirements are predominately satisfied by INTELSAT and INMARSAT. INTELSAT provides the large T-1 (1.544 Mbps) capacity into the theater while INMARSAT furnishes single channel (9.6 to 56 Kbps) service suitable for limited mobile voice and data applications.

USCENTCOM has increased its in-theater peacetime DII capabilities. Requirements for and reliance on commercial leased capabilities continue to increase with even greater requirements envisioned for contingency use of commercial satellites. Additionally, USCENTCOM is investigating modifications to existing tactical military satellite communications shelters to handle commercial C and Ku frequency band links.

Relocating critical communications nodes, put into motion by Operation DESERT FOCUS and related force protection activities, resulted in the complete restructuring of the theater's C4 systems architecture. Over a five month period, ten tactical satellite systems, 24 satellite communication links, two strategic telephone switches, and four tactical telephone switches were activated or relocated. Additionally, two strategic telecommunication facilities were built from a cold start. Movement of these assets resulted in relocating or activating over 1,500 critical C2 circuits while simultaneously supporting Operations SOUTHERN WATCH and DESERT STRIKE.

The heroic efforts of the men and women of USCENTCOM and its supporting forces**,** working side-by-side with DISA and our Saudi partners, significantly enhanced the capability to extend C2 services to in-garrison and maneuver forces. All the C4 professionals involved with supporting USCINCCENT, both in the AOR and thousands of miles away in the CONUS and Hawaii, realize that more still needs to be done. These individuals and their organizations have proven they are up to the challenge. Colonel Tom Verbeck stated early in the JTF SWA relocation that it "would take a miracle a day" to meet the timelines established by USCENTCOM's senior leadership. Bolstered by hard work and dedication, the challenges were overcome and the effort completed. USCENTCOM forces are now better protected and postured to deter, defend, and, if required, to fight and win in their assigned Area of Responsibility.

About the Authors:

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Defense Department Classic Becomes an Object of History

Courtesy of DISA Public Affairs

The year was 1972. Americans were singing *American Pie*, tuning in to the television show, *M*A*S*H*, and buying handheld calculators which had just hit the market.

Meanwhile, that same year, the Department of Defense installed its first new system designed to streamline and automate military planning. That system, the Worldwide Military Command and Control System (WWMCCS), was eventually installed at 35 major military sites with hundreds of remote locations. Thousands of soldiers, sailors, Marines and airmen used WWMCCS to plan and conduct real and exercise contingencies.

Twenty-five years and numerous upgrades later, like other classics of 1972, WWMCCS is just a memory to those warriors who developed and used it. It was replaced in 1996 by a new command and control system.

> In July, LTG David J. Kelley, DISA Director, donated a WWMCCS terminal to the Armed Forces History Collections at the Smithsonian's National Museum of American History.

"WWMCCS was a vital step forward in military history," said General Kelley. "The system contained information on every unit and support function in the Department. Designed for the Cold War, WWMCCS ADP provided us with the ability to partly automate planning for large scale military operations. It created an appreciation in the military for high technology that continues to evolve today. WWMCCS and the men and women who used it played a crucial role in our country's defense. They served our nation well."

As technology evolved, the WWMCCS became antiquated, costly to maintain and did not allow for easy expansion. Additionally, the Desert Shield deployment with its requirements for increased cooperation and interoperability with our allies and for a worldwide common operational status of U.S. forces, revealed deficiencies that the WWMCCS architecture simply wasn't designed to handle. In 1993, the Joint Staff initiated the Global Command and Control System project to build the worldwide operational picture and to expand the functions WWMCCS performed.

On August 30, 1996, Lt. Gen. Albert J. Edmonds, then DISA Director, officially pulled the plug on the WWMCCS Intercomputer Network. Concurrently, the Joint Staff declared the Global Command and Control System as the joint command and control system of record. The deactivation of WWMCCS closes a chapter in our Nation's military history and opens a new era of information dominance.

How Can I?

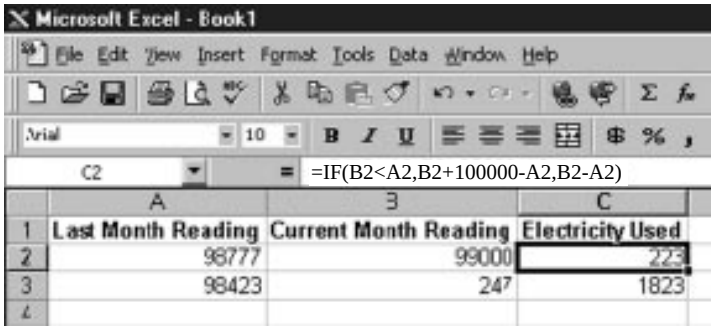
The Microcomputer Education Branch of NCTAMS LANT in Norfolk, Virginia provides training and technical support for its customers. Included in this service is answering users' questions. One of the most recent inquiries is listed below. If you would like further information or have questions you need answered, please call commercial (757) 444-7976; DSN 564. Their e-mail address is training@ccmail.nctamslant.navy.mil.

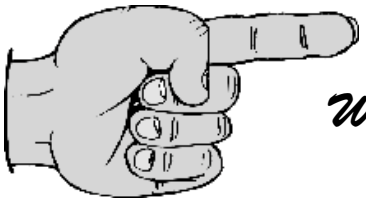
Excel 7.0

Question: *I have monthly readings for a meter that "rolls back" at 99999 to 0. When this happens, the new reading is less than the previous and the difference gives me a negative value. How can I calculate the values for all readings with one formula?*

Answer: Use the formula shown below to get the values you need:

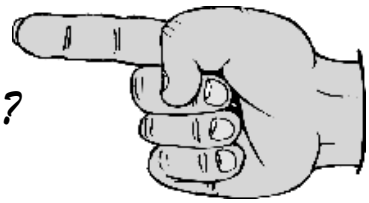
=IF(B2<A2,B2+100000-A2,B2-A2)





Web Site 102:

Which Way is Your Web Pointing?



By Major Dale Long, USAF

Question: *What do the Maginot Line and the World Wide Web (WWW) have in common?*

For those of you not familiar with this particular bit of European military history, the Maginot Line was a series of really big guns meant to protect France from invasion by Germany. In theory, those big guns would sit there, wait for an approaching German army and make their impact in various and sundry ways.

Unfortunately, the Maginot Line had a couple of weaknesses. First, the guns were fixed emplacements, which meant they could not be moved. Second, the guns only pointed one way: east, towards Germany. They couldn't be turned to meet a threat that did not approach from the expected direction.

The Maginot Line was a huge strategic investment. Unfortunately for the French, the German army simply went around the Line through neighboring Holland and Belgium, got behind the guns and occupied France. The Maginot Line, from a military standpoint, was a complete waste of time, money and manpower that ultimately failed to provide any significant contribution to the defense of its nation.

The World Wide Web seems to be a lot like that.

World Wide Waste?

Yes, that's right. I'm comparing the web, computer technology's latest religious idol, to one of military history's greatest examples of myopic planning, development and implementation. I can hear the outraged screams of some of the Webmasters in the audience now.

However, I'm also listening to a growing chorus of voices asking why we're investing so much time, effort and money into a media where some of our more noteworthy accomplishments include making a ship's bell clang on computers around the world and publishing pictures with the squadron commander's head superimposed on Rambo's rippling body. At least those are entertaining. The really tragic sites are the ones that are definite triumphs of style over substance.

Here's test question #1: What percentage of the people designing Web pages for military organizations have that particular task included in their official duty or position description?

In my experience, not very many. Yes, we've collectively decided that we need to be *on the web*. But at what cost for what benefit? How many man-hours will we expend just to create hacking targets for Scandinavian teenagers?

For those of you with a WWW site, here's test question #2: How much did your web site (world-wide or internal) cost to develop in hardware, software and man-hours?

Please remember to double the labor cost for anyone not officially employed as a web page designer, as every hour they've spent coding HTML is one they didn't spend on their regular day job. If you can't answer this question, don't feel too bad. No one I've asked so far has been able to come up with much of an answer.

And finally, test question #3: How do you measure the benefits of your web pages?

"Well, we can publish lots of information for people to read," is not a quantitatively significant answer. And while counting the number of pages you've published and how many times people access them is quantitative, they are not, by themselves, significant indicators of real value.

It's Payback Time

Let's get down to the crux of the matter: how can we, the military, use the World Wide Web to further the cause of national defense? All this show-and-tell stuff can be fun, entertaining and maybe even semi-useful from a sales (recruiting) and marketing (public affairs) standpoint. However, aside from being part of a multi-level marketing approach, what is hypertext transfer protocol really doing for us?

The basic payoff should be the same thing that prompted the development of ARPANET back in the late 1960s: the ability to reduce time and distance to information. If the web is to make the individual, and thereby, the organization more efficient, it must enable a demonstrable change in the length of a process, length of training, length of the experience curve, or cost of doing business from using it. With the networks and tools we have at our disposal, we now have the opportunity to completely reengineer information-intensive processes to save time and reduce distance.

Which begs the question: just what are we doing about it?

On-Ramps to the Information Superhighway

We will not be able to use the web as a universal medium for information dissemination/sharing unless we provide access for all our users and data entry points for our information providers.

Expanding access will usually involve increasing the number of points at which people have an interface to the system. If 200 people only have access to a given repository at one location, your access ratio is 200:1. If you expand access so that there are 160 access points, the ratio drops to 5:4, which is much better for information that needs widespread dissemination. In practical terms, this is the difference between having a single computer with a CD-ROM versus a local area network with access to that same CD-ROM on a networked CD player.

Entry ratios work the same way. If there's only one place to enter data from 200 people, you have a high potential for a bottleneck. Expanding entry points allows a much higher rate of input.

It is possible that by granting too much access or entry you can overload your systems or increase security risks. However, if people don't have access, why do we have these systems in the first place?

Despite my earlier comments, I am very excited about the potential of the WWW to increase our ability to work with information. Some organizations are leveraging the information transportation capabilities of the WWW to make significant changes in how they do business. Let's look at two practical WWW implementations that reduce time and distance by increasing both entry and access to information: The Air Force's *Assignments Online* and PlanetAll.com.

Assignments Online

There are few things that can cause more storm and stress in military life than trying to get a new assignment. In the *old days*, much of the activity and rules seemed very mysterious or threatening to the people subject to the process. However, the Air Force Personnel Center (AFPC) has demystified the process a lot by moving much of the information sharing and dissemination for the Air Force officer assignment system to a WWW site located at:

http://www.afpc.af.mil/asgnment/htdocs/officer.htm

I'd like to see more web operations like this one. AFPC advertises job openings on their WWW site which Air Force officers can apply for by checking the boxes for the assignments they want. It's a simple, powerful implementation made possible via the WWW.

Let's look a little closer at how this process works. There are two main entities in the assignments process: person and job. This is, in relational terms, what is known as a *many to many* relationship: there are many people and many jobs. People need jobs, and jobs need people.

Between the two is a relational entity we'll label *person/job* which uniquely identifies who is assigned where. The desired end state is that every job have a qualified person performing it. This example is, of course, extremely simplified. There are a host of other factors that go into matching people and jobs. The Air Force military personnel system, like those of the Army, Navy and Marine Corps, manages thousands of jobs at hundreds of locations around the world. The point to remember is that personnel management has traditionally been an immense human resources process for the military that involves huge amounts of information about both jobs and people.

One key task is advertising what jobs are available to every location where there may be qualified candidates. With the AFPC web site and the advent of desktop web access at most locations, Air Force officers can browse the AFPC web site for openings without time-consuming trips to the military personnel flight office or attempts to reach an assignment officer by phone.

Having baited the trap...uh, excuse me, advertised the available positions, the next step is finding out if there are any volunteers. The AFPC site allows interested officers to fill in a form and apply for jobs right from the web page. They can also send e-mail to the assignment officer responsible for managing the position, which I've found from personal experience to be a much better way to stay in touch than depending on phone messages.

This web-enabled system reduces the time and distance by expanding opportunities for both access and data entry. No more trips to the base personnel office, no more frustrating calls to the assignment officer's answering machine and no more glacial routing and coordination of assignment preference forms. The information is collected from all over the world and aggregated centrally for the assignment officers, who then have more time to find the right person for the job, or vice versa.

Col James W. Green, Director of Assignments at the Air Force Personnel Center, is very enthusiastic about what the web has done to help them process over 125,000 assignments a year for Air Force personnel.

"Advertising Air Force assignments on the World Wide Web is revolutionizing our business," said Col Green. "The number of *hits* on our web grows weekly. Currently, we average over 4,500 hits against our static home page and our interactive More Voice/More Choice systems. Over 70 percent of volunteer statements now come over the web, reducing the workload on our assignment officers and allowing them the time needed to give specialized attention when necessary."

The WWW, as a communications medium, enabled what was previously virtually impossible for the assignments process: direct, near real-time interaction between job-seekers and job managers. The impact of the technology is what is known as a *first level technological effect*, where the technology has an impact on a specific business process.

There are some other benefits aside from the effects the web has had on the assignments process, which can be categorized as *second level sociological effects*. These are effects that technology has on organizations and their cultures as a whole.

In this case, one second level effect of the WWW on the assign- ▶

ments process in the Air Force has been to facilitate better mentoring and career management for the people involved.

"Since the WWW has given us interactive communication with commanders and members, this sharing of information has now opened up the once *mystical* assignments business," said Col Green. "AFPC is no longer regarded as *someplace in Texas* that drops assignments on unsuspecting officers; it's a transparent system of interaction among commanders, members and assignment officers."

"By providing commanders and members with current personnel and job advertisement information, we help commanders mentor their troops," said Col Green. "Commanders not only have information readily available to help them discuss, in specific detail, the jobs open to their officers, but also can provide officer professional development comments on those individuals to the AFPC. These comments aid assignment officers by completing the pictures on individuals from the viewpoint of the commanders."

An infusion of technology does not necessarily make a process *impersonal*, as the Air Force's Assignments Online proves. What is important is the sharing of information between people, a distinguishing characteristic of an information system versus simple information technology. In this case, the changes to the communications medium used for the assignments process have had a pervasive, positive effect outside the immediate environment the system inhabits, a good sign that it's becoming a vital and integral part of the total AF culture, not just the Air Force Personnel Center.

"We look for Air Force Assignments Online on the web to grow, and we have numerous initiatives in progress to improve speed, reliability, security and availability of information," said Col Green. "The AFPC Directorate of Assignments is well on its way to riding the web wave of technology to keep Air Force members informed and up-to-date."

WWW Connect the Dots

For our second example, let's look at a site with some automation: the PlanetAll personal contact management site at http://www.planetall.com.

PlanetAll is a free service that keeps you in touch with other people on the web with similar backgrounds or interests. It was founded in 1996 by Warren Adams and Brian Robertson with the vision of bringing people together face-to-face using the web. PlanetAll was launched on November 12, 1996.

There are a couple of very modern, liberated, data management principles behind how PlanetAll functions. The first is that every individual member manages their own information. You decide what people can and cannot see about you, what groups to join or start and what updates or messages you want to receive. Control over your individual data in the system is decentralized to user level.

However, the organization and dissemination of the sum total of PlanetAll information is managed centrally by the web site based on how you set your preferences. For example, I've registered as an alumni with groups affiliated with all three of my old colleges and universities. However, I've restricted my affiliation searches to only those people who attended those two schools the same time I did, as I'm not really interested in all alumni, just people I went to school with.

I've also declined to receive any mailings from any alumni associations who may think I have some obligation to continue to support these institutions through annual and other giving programs forever. So far, so good. I haven't gotten any junk mail.

If you want, the PlanetAll system will automatically send birthday or anniversary reminders for all the other registered users you want to stay in touch with. If you update your travel schedules in the appropriate area, PlanetAll can automatically notify you when any of your selected contacts will be in the same place at the same time. It can also send you regular news summaries as often as you want, from daily to monthly. It's a very flexible system.

And if there isn't a group there that meets your needs, you can create one from scratch and tell your friends. In short, PlanetAll is part personal organizer, part concierge and part conscience, all rolled into a free, web-enabled service.

Before I start sounding too much more like a commercial, let's examine the theoretical basis and practical applications of this type of system for the military.

Basic Modeling

Distilled down to its most basic level, PlanetAll is about entity relationships. You and I, for example, are individual entities. There are also organizational entities composed of both individual and sub-organizational entities. For example, Sergeant Smith belongs to a squad that belongs to a platoon that belongs to a company, which belongs to a battalion, etcetera all the way up to the DoD. Sergeant Smith may also belong to one or more other entities, such as school alumni, a church or a professional society.

Each entity (person or organization) has certain attributes, things like size, shape, color, weight, height, composition, mission, goals...whatever we measure ourselves and our organizations by. Many of these attributes are similar to those possessed by other entities, and some of these shared interests act to link us together: hobbies, games, careers, etc.

All people and most organizations can also be tracked in terms of time and space. While at any particular location, entities participate in events, which can range from birthday parties to staff meetings to battles. PlanetAll helps monitor and coordinate the events of participating entities. If you keep your information up-to-date, it will send out event reminders and let other people in your sphere know where you are and what you're doing.

One big difference between PlanetAll and many similar WWW and Intranet sites is that PlanetAll is multi-organizational. New group structures may be formed within the whole at any time, and

individual members may belong equally to more than one group. It is a very flexible system, capable of catering to a wide variety of users.

This is very different from most web sites, and particularly our military information structure network models. Most of the *social* information systems I've encountered are based on a single world view, where the formal organizational hierarchy or the main topic site for the site sets the rules. While this gives a certain amount of stability to the information structures and systems, it can sometimes make it difficult for people who don't belong to the same organization to cooperate or coordinate over that particular network. Simply trying to establish and coordinate access rights to a shared folder outside an organizational hierarchy can take several days if we don't already have policy in place that recognizes a great deal of work is done by cross-functional groups and committees.

Guidelines

The two sites we've looked at here serve different purposes, but both share some features that I'd like to see more of us use as we develop systems:

Centralized data administration: The database systems are centrally administered, which makes them easier to maintain. Even if the database is distributed among two or more servers or operating locations, you don't have to worry about standardizing data elements if the entire system is administered as a single entity. Two current DoD initiatives that reflect this approach are the DoD Enterprise Data Model and the DoD Data Dictionary.

Distributed access: Total system access can be defined as "Anyone, anywhere, anytime." A key performance parameter for distributed systems is that when a user does something the system should process it automatically, without further manual intervention until the information reaches its intended destination.

We do, of course, want to further limit system access only to authorized users and preserve their access while denying access to unauthorized users. Aikido teaches that any strength can be turned into a corresponding weakness, so the more access you have, the more vulnerability you must deal with.

Life is full of little trade-offs.

Standards-based: Since the site is on the Internet and HTML-based, anyone with a frames-capable browser can log in and share information. While the *frames* used on the PlanetAll site are vendor enhancements and not part of the formal HTML standard, it's easy enough to get a browser that will read them. The primary input/output is text, which is about as close to a universal standard that the computer world has.

The real key to interoperable systems will be standard data formats. If our data follows a standard, platform-independent format, it shouldn't matter if we're using the same equipment or software to process it.

A personal example: While I was in graduate school a few years ago, I helped develop some project management risk analysis software. My partner, who was a professional software engineer, knew COBOL; I knew Pascal. We each wrote three of the six modules that handed off data to each other for processing. Despite the fact that we wrote our different applications in different languages, all of our programs agreed on standard data formats, handed off the data from one module to the next and produced the desired result.

On a larger scale, there have been collaborative projects involving 1000+ computers linked through the Internet working cooperatively to complete tasks. Again, the key here is having a consistent and enforceable data standard.

Development Guidelines

If you remember my three test questions, here's some guidance you can work from to prevent excessive stress when the boss asks why he just spent umpteen gazillion dollars on your WWW site or Intranet:

1. Have a business purpose. Don't develop a WWW site or Intranet just because it's a cool thing to have. There needs to be some purpose to every page and document. Remember: static information that just sits there and waits to be read won't really help any of your business processes. An Intranet's greatest value, for example, is probably as a transportation medium for data that is frequently and routinely collected by and shared between many people in an organization. Home pages are necessary as a navigation method, and *show and tell* information may seem mandatory or entertaining. However, the real value will come from systems that expand data entry and access to reduce information-related overhead.

2. Plan first, develop second. One common problem I've seen with large organizational WWW and Intranet sites is that 150 different developers will launch themselves independently as soon as you turn the server on. Three months and 1500 HTML pages later, some poor person will then have to write policy for managing this ever-growing information conglomeration. Write the rules of engagement first.

3. Train, train, train. If you've decided that you absolutely must have an Intranet or WWW site, don't leave people to train themselves. If it's important to your business, make the investment and send them to HTML school. Most colleges and universities will offer HTML classes. In addition, you can form local HTML user groups where people can share design tips and mentor less experienced developers.

The next article in this series will deal with policy and procedural issues for managing Intranets, which I think may turn out to be the greatest advance in organizational information sharing since we installed telephones.

Until then, Happy Networking. :)

About the Author: Long is the Chief, Command Information Management, United States Strategic Command. He holds a Master of Science degree in Information Resource Management from the Air Force Institute of Technology.

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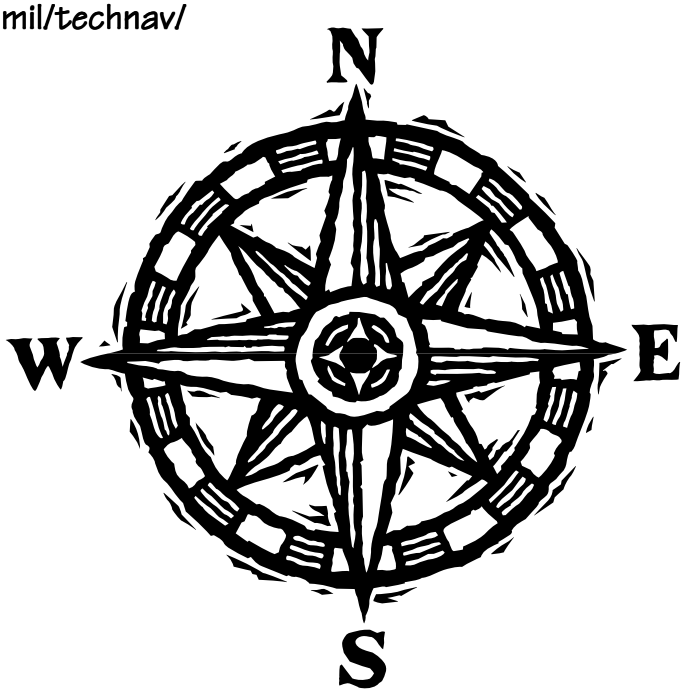

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CD Recorder Technology

By Rick Paquin

CD Recorders (CD-Rs) got off to a rough start a few years ago because they were expensive compared to other forms of recording media. To add to the problem of expense, they weren't too dependable, leaving many purchasers wondering what to do with their "Frisbees" (the name commonly referencing poorly copied CDs that were unreadable and unrecordable). Many of them were probably used as Christmas tree ornaments.

First, a little overview on how they work.

Basically, CD Recorders work this way: A small laser in the recorder actually *burns* tracks into the composite material sandwiched between two plastic layers of the CD. The track is continuous and the process of burning the track is called a *session*. Because the laser burns through the bottom of the CD, a heavier plastic coating is used to seal and protect the burned composite on its bottom side after cooling. Transfer rate is slow because of the thermal mechanical process. CD-Rs differ from commercial CDs from the standpoint that commercial CDs are pressed from a mold and are a little more durable.

What was the problem with initial CD-R Technology?

Poor CD copies occurred for the most part on early machines due to a failure of the input data stream to keep up with the high, constant requirement of the recorders recording session. The small buffer size was insignificant with respect to smoothing out data losses. Momentary loss of data caused by the slower computers would usually yield the dreaded error message "buffer underrun" during a recording session, after which the CD became useless and could not be reused. A high failure rate coupled with the high cost of $12 - $14 per blank made CD recording very costly and time consuming for the user.

Why did these first recorders produce so many bad copies?

The laser must burn the disk at a certain rpm coupled with a certain laser intensity and data stream. If a CD is copied at a speed of X1, the laser burning the track must be modulated with a volume of data with respect to the speed of the revolving CD. Data flow **must** be continuous through the entire recording session since each recording session forms one continuous track. Since one single X1 session (650Mb) could take up to 1 1/2 hours for completion, the chances were great that a momentary interruption in the data stream could occur during a session.

Shorter multi-sessions are now optional features and can reduce the likelihood of a data-stream interruption during a session. Multi-sessions, though, were not a satisfactory solution since they required a complete directory rewrite each time and **any** improperly closed session could prevent the directory from recording previous session entries properly.

When this occurred, the previous data on the disk could not be retrieved, making the CD media a worthy tree ornament. X2 (and higher speed) machines increase the laser intensity and burn tracks faster. This only compounded the data supply problem as data demand is twice as high for the X2 speed.

The Data Stream

Since a CD recorder must have a steady stream of data applied to the laser throughout its entire burn cycle (session), the data stream input to the recorder becomes the critical facet. At the now higher speeds of X4, you must modulate the laser with a steady stream of data at a rate of 600 K/B per second throughout its entire recording session. If the data stream falls short of this speed, or is interrupted at the laser at any time during your session, the entire session could be unreadable if proper track closure doesn't occur.

Therefore the key to dependable recording depends on a "high rate" data flow at the recording laser head during the entire session. The faster you want to record, the higher the risk of total failure if the data stream throughput from the computer to the laser can't keep up. Therefore, the faster the computer data output, the better your chances are that the laser will achieve it's required input rate. With non-Pentium computer systems, your maximum recording speed (regardless of model) may only be X1.

Recorder Buffer Memory

There is yet one more very significant factor with respect to dependable record sessions and the critical data stream - the recorder's "buffer." Even with the fastest computer, the data stream can be interrupted due to occasional hard drive access or network sharing environments. For that reason, recorders have a data buffer and they vary in size. Early recorders had a 512K buffer for single speed machines. As the speed of the recorders increased, generally so did the buffer. The fact remains that there are some X4 speed CD Recorders that still only have 512K buffers. With such a small buffer ▶

your computer data speed requirements become extremely critical. In fact, you'd better have the fastest computer on the market today with the fastest hard drive to ever achieve a successful record session at X4 speed. Such recorders should be avoided. I recommend a buffer size of at least 1MB, but 2MB provides even more protection against a data flow outage.

When data is sent from the computer's hard drive to the recorder, it fills the recorder's buffer with data before it's received by the laser record head. A separate CPU in the recorder moves data in the buffer to the record head at the required demand rate. If an outage occurs at the input of the buffer, the recording session isn't affected as long as some data already exists in the buffer. A full 2MB buffer can deliver data to the record head with up to a three-second data outage from the data source at the X1 speed. Faster speeds are less forgiving. The larger buffers on the new machines yield yet another benefit. Let's say you're using one of the higher record speeds coupled to a system that can just barely keep up with the data demand. Now, let's say a data outage occurs because someone decides to use the computer to access mail or save a large file to the hard drive at the same time you're recording a session (this happened to me). With the earlier machines it spelled disaster and you had the dreaded buffer underrun.

Recorders today with the larger buffers can actually sense the loss of data at the buffer's input and, since the buffer is large enough, permit proper closure of the track. True, the track is incomplete; however, proper closure permits you to reload the incomplete track and try another recording session using the same CD media!

This is really a big plus, but it's contingent upon whether you select the option to "close the disk" at the beginning of that session. Closing the disk is the "write protect" feature for CD-Rs and is used only when you desire not to enable future recording. Even on large single sessions that will normally fill up a CD, I recommend you leave about 10MB free on the first session and close the disk as a separate final session. This gives you the safety catch to reuse the disk after an interrupted session.

Why do I need a X4 speed?

The early recorders had only one record speed of X1, followed by X2. Recorders today boast speeds of X4. Keep in mind that the final CD copy will appear exactly the same to your CD player regardless of what record speed you choose, making the newer CD Recorders simply more of a potential time saver **if** your computer can pump the required data speed to the recorder. If it can't keep up with the required 600KB/S, then you will be forced to run at the lower X2 or even X1.

Even if you have a 200 Mhz system with a super fast hard drive, you still may find your better recording reliability/capability at the X2 speed. Keep in mind that the 2MB buffer will still be of greater benefit to you in terms of reliability and those larger buffers are only found on the X4 machines.

Are these CD copies durable & safe for long term storage?

CDs, whether copies or originals, are the safest form of storage. They are virtually unaffected by magnetic fields and, if handled normally, can last for 20 years or more. Compare this to tapes, which can be easily damaged with magnetic fields, humidity and stretching. In fact, even under ideal conditions it's not recommended to rely on a backup tape for more than a year, making CD media much more advantageous for archiving.

The coating on the top side (normally used for labeling) is actually the most sensitive part of a CD since it's quite thin and can be easily damaged. There are special labeling considerations since any type of writing with even a felt tip pen on its top side can easily remove the top layer. Removal of the top layer exposes and possibly damages the internal substrate material causing loss of data. As long as you remember this, it's not a problem.

It's my finding that newer generation recorders are more user friendly and forgiving due to the larger internal buffer supplied with higher speed machines. Even though your computer system may limit you to the lower speeds, the larger buffers yield much more dependable operations. Considering that blank CD-R media has come down dramatically in price, (now $3.50- $6), CD-Rs are now a recommended device for your data archiving storage needs.

How can I order one?

Sylvest Management Systems has a X4 (record speed) Yamaha recorder with a 2 MB buffer on the SEWP II NASA contract for users of Windows 95 or NT. This *internal* recorder model CDR-400 is priced well at $899 (CLIN SA9505) and includes the popular software ECD PRO 95 for professional recording of all data and audio. The package also includes 10 blank CDs. For Unix users, the CDR-400/TX-PC is available for $2,423 under the same CLIN. You must specify the operating system on your order.

About the Author: Paquin is a member of NCTAMS LANT's Technical Specifications and Support Branch. He can be reached at (757) 445-2568; DSN 565-2568. His e-mail address is rick_paquin @ccmail.nctamslant.navy.mil.

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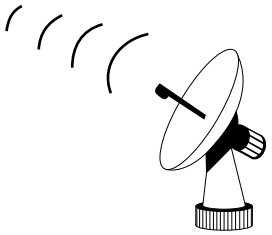

Defense Message System (DMS) Training

By RMCM(SW) Rusty Haynes

A comprehensive DMS training program is being developed and executed as part of DON DMS implementation. The objectives of this program are to:

- Adapt current knowledge skills from legacy systems to DMS.
- Use the best available training practices to reduce on-site proficiency training requirements and On-the-Job Training for operators, administrators, managers and supervisors.
- Develop proficient skills among users, operators, administrators, managers and supervisors to meet mission requirements for efficient operation of the DON DMS.

During the AUTODIN Phase-Out/DMS Phase-In period, training needs and requirements will be assessed on a site-by-site basis and documented in the User Implementation Plan. Initial training will be provided prior to installation of infrastructure components. Government customers will be able to order additional training at the discretion of the individual site.

The training program will provide a variety of courses ranging from basic DMS user education to comprehensive system administrator training. Brief descriptions of specific training courses for DMS are outlined below. Detailed descriptions are contained in the *U.S. Navy DMS Navy Training System Plan (NTSP).* DON activities can contact the DON DMS Training Coordinator, RMCM(SW) R. Haynes at commercial (619) 524-7559 or DSN 524-7559 to obtain additional training information.

For those whose job descriptions only require them to use the services of the DMS, Lockheed-Martin Federal Systems (LMFS) offers a User Agent (UA) training curriculum for all three currently available UA products (Microsoft Exchange, Lotus Notes and ESL EXM). The training allows for a maximum of 25 students per session and lasts one day.

As an alternative to formal training, Computer Based Training (CBT) is also available. CBT in all three UA products is available for download from the SPAWAR homepage at www.spawar.navy.mil/DMS. In addition, diskette copies may be obtained by contacting Naval Computer and Telecommunications Command (NCTC) Training Division at commercial (202) 764-0155 or DSN 764-0155.

Training in the administration of the DMS is appropriate for people responsible for maintaining the DMS components and infrastructure. These may include mail administrators, system administrators, computer security personnel and others responsible for assuring operation and availability of the DMS. Enrollees in the DMS system administrator course are expected to have at least one year of experience in LAN Administration and basic knowledge of UNIX, WINDOWS NT and database structures. Courseware for DMS System Administrator training has been developed by LMFS and was accepted by the Government for release in May 1997. Formal training at LMFS began in June and can be ordered from the LMFS DMS contract.

Plans for a Department of the Navy schoolhouse at Fleet Training Center (FTC) Norfolk, Virginia are in place. The schoolhouse will be equipped with four suites of DMS Technical Training Equipment (TTE) consisting of six workstations each. The DMS System Administrator pilot course at FTC Norfolk will commence in February 1998 with a Ready for Training date of April 1998. Course length will be 25 instructional days and a Navy Enlisted Classification (NEC) will be assigned upon completion. In addition to formal training at FTC Norfolk, an overview of DMS was incorporated into the existing Radioman (RM) rating-pipeline training as well as into the Information System Officer (ISO) school.

Course Descriptions

- The Operating System Administrator (OSA) training is designed for those administering the DMS operating system. Module length is five days. Topics include DMS Overview, DMS Windows NT Operating System, DMS HP UNIX Operating System and DMS Operating Systems Management.

- The Directory System Administrator (DSA) training is designed for those responsible for the DMS DSA. Module length is seven days. Topics covered include the Directory User Agent (DUA), the Administrative DUA (ADUA), the Directory System Agent (DSA) and operations and maintenance.

- The Message Handling System (MHS) Administrator training is a comprehensive course on the entire MHS, appropriate for those System Administrators with responsibility for all aspects of DMS. The module length is six days. Topics include System Administration, Microsoft Message Transfer Agent (MTA), Lotus MTA, the ESL MTA, Message Store (MS), Mail List Agent (MLA), Profiling User Agent (PUA) and Multi-Function Interpreter (MFI).

- The Management Workstation (MWS) Administrator training is appropriate for those with responsibility for the operation and maintenance of the MWS. The module length is five days. Topics in this course include the help desk, system planning, configuration management, fault management, performance management, accounting management, security management and operations and maintenance.

Information on training products available through the LMFS contract may be found at the LMFS DMS website (www.lmdms.com/products/ftpinfo.htm). Training may be ordered through Paul Rigdon, NRaD San Diego, Code D632 at commercial (619) 554-3587 or DSN 554-3587.

About the Author: Haynes is the DON DMS Training Coordinator. He can be reached at commercial (619) 524-7559 or DSN 524-7559 to obtain additional training information.

ViViD Questions & Answers

Submitted by the Navy IT Umbrella Program Team

Question: *What is ViViD a*

developed?

Answer: The ViViD con

signed to help solve the Navy'

nications problems. These p

lems include, but aren't limited

to, the:

- Demand for greater bandwidth and connectivity as the need for integrated voice, video and data networks grows and becomes essential in the next century.
- Personnel reduction through downsizing and BRACs.
- Reduction in base operating support funding.
- Lack of a Navy standard for pier-side connectivity.
- Little or no configuration management.
- Lack of DON-wide infrastructure configuration management/inventory control database (The Umbrella Program will gather this data which will be accessible to DON personnel).

Through ViViD, the Navy will be able to purchase, lease, lease-to-own or outsource the necessary standards-based hardware, services, maintenance and training to help alleviate these problems. In addition, ViViD will help migrate the diverse infrastructures towards interoperability as well as mitigating sunk costs by providing backward compatibility to legacy systems.

Question: Isn't the goal of Base Level Information Infrastructure (BLII) the same as ViViD? Will they be competing with each other?

Answer: Although the goals are essentially the same, they don't compete; they complement each other. ViViD is simply a tool that can be used to implement BLII. The BLII and DMS Programs are managed and implemented by SPAWAR PMW 152. ViViD will be the main acquisition tool used by PMW 152 to implement BLII. The Umbrella Program worked very closely with the head of PMW 152, CAPT Dave Gamble, on ViViD's strategy and design.

Users have traditionally modernized *portions* of the infrastructure that supported their own programs and projects. As a result, many different strategies have been used to acquire the necessary hardware, software and services. This situation has helped to perpetuate stovepipe systems, minimize interoperability, raise the cost of logistical support, deny the DON the ability to achieve quantity discounts and made it very difficult for DON to comply with DoD Directive 4640.13. The new ViViD contract, if used will help alleviate these problems.

ry IT Umbrella Program is obligated e Assistant Secretary of the Navy for Research, Development and Acquisition (ASN RD&A) to help overcome these problems, which adversely impact on all of DON. Through lla Program, a centralized database will be developed to assist in configuration management/ inventory control. With the help of the ViViD contractors and customers, this database can be implemented and maintained DON-wide.

The long-term goal includes allowing those responsible for various portions of the infrastructure to access this system. If taken to the maximum potential, information concerning the current state of the infrastructure as well as any improvements (e.g. installation of a cable plant) underway or scheduled at any DON location would be available to those who need it. A lofty goal, but attainable with your help.

Question: *Why did the Umbrella Program undertake ViViD?*

Answer: The Umbrella Program specializes in placing precompeted DON-wide acquisition vehicles and providing the support infrastructure. This responsibility is included in the Umbrella Program charter held by COMSPAWARSYSCOM from the ASN RD&A.

Question: *What about IT21? How does ViViD fit into this effort?*

Answer: ViViD provides a uniform method of providing *robust infrastructure* for both shore stations and ships as required by IT21. Through the use of the common integrator, the Navy is guaranteed interoperability and integration at the equipment level. ViViD can provide total or partial solutions - from a single piece of equipment to a metropolitan area network and provides the ability to purchase, lease-to-own or outsource these resources.

ViViD recognizes that DON has a limited budget and facilitates achieving goals, such as IT21, by permitting the user to phase-in or migrate to the objective environment. For example, one ViViD contractual provision ensures that once a component is introduced into the user's infrastructure, the contractor will support that component and the interoperability thereof. This will end the finger pointing about who owns the interoperability problems. While ViViD contractors are not obligated to change or modify *our owned* infrastructure, they are obligated to troubleshoot and resolve interoperability problems caused by *their* components.

Both ViViD contractors have toll-free numbers:

Lucent: (888) VIV-ID4U
GTE: (888) GTE-VVD1

There are people to help with ordering and technical issues. Both contractors are also required to have laboratory facilities to assist with interoperability problems and for general trouble shooting. Standard warranty coverage is four years. The cost of services such as these are included with the line-item price under ViViD. There is no additional charge.

The Umbrella Program offers similar services. Any ViViD problem can be reported to the PMO. Since we're relocating to San Diego, please check for the latest PMO POCs on the web at www.chips.navy.mil/it.

Question: *Can we use our own Contract Officer Technical Representatives (COTR) if we use ViViD?*

Answer: Customers must identify a technical POC on each delivery order. This person, or any other as assigned by the Ordering Officer (any duly warranted Contracting Officer with the authority to issue delivery orders), can be the Alternate COTR or COR. See Part G of the ViViD contract which delegates this position to the customer.

ViViD assumes that customers will use their own resources (e.g., program managers, Contracting Officers and COTRs). The contract is structured so that Contracting Officers and COTRs/CORs are delegated to those who are most familiar with the requirement and are stake holders. ViViD *does* have assigned CORs, Contracting Officers and Program Managers, but these individuals are reinforcements to the customers own resources. The ViViD PMO will assist with technical and ordering issues as well as any performance problems that may arise.

Question: *How do I order from ViViD?*

Answer: First, determine your requirements. If you're ordering equipment, have a warranted contract officer issue the delivery order on either a SF 1449 or a DD 1155. Send the completed order to the ViViD Central Order Management Office (COMO). The order can be mailed or faxed to:

Technical Specifications & Support Branch
Code N811.2
NCTAMS LANT
9625 Moffett Ave
Norfolk, VA 23511-2784

Fax: (757) 445-2103; DSN 565

The COMO has assigned Customer Service personnel who will ensure your order is correct and using the latest contract modification. They'll also enter the order into a database which will assist in the Configuration Management/Inventory Control project and enable the PMO and customer to monitor the contractor's performance.

The COMO will fax the order to the correct contractor and follow up with an e-mail if copy quality is lacking. Once the order is received, the contractor has three days to accept or reject it. We recommend that you work with the contractor to minimize rejected orders. The required delivery time is determined by the type of equipment ordered. For most cases, it's 30 days for CONUS delivery.

If you're ordering services, have a warranted contracting officer issue a statement of requirements via a Task Requirements Notice (TRN) to the contractor to solicit a proposal. Negotiate if necessary. The rest of the procedure is the same as for equipment.

Another option is to use your Government credit card. With the credit card, you can call, fax or mail your order to the appropriate contractor. The contractor will forward the information to the COMO.

If you need assistance, contact the PMO.

Question: *ViViD is touted as a flexible vehicle, but I don't see the specific equipment I need on either the Lucent or GTE contracts. What do I do?*

Answer: Contact the PMO. ViViD has just been awarded and we know it isn't perfect. You can help by identifying weaknesses or deficiencies. ViViD will constantly be modified to maintain leading-edge technology and provide maximum benefit. However, don't assume if you don't see it, it isn't there. There is some flexibility that the customer can use.

Question: *Must I give both ViViD contractors the opportunity to offer proposals against my requirement?*

Answer: No. If you already know which contract represents the best value for your requirement, proceed and issue the order accordingly. If you're not sure, the PMO is ready to provide assistance and/or both contractors can be solicited. If both contractors are solicited, the more you tell them about your selection criteria, the better they can structure their proposals to meet your requirements and desires. You may also ask the contractors to propose more than one solution permitting you to evaluate multiple approaches.

Question: *Is ViViD intended for ashore support only?*

Answer: No. ViViD is for both ashore and afloat. Some items, such as shipboard cable, connectors and voice switches are intended mainly for afloat use. For example, GTE offers the RedCom switch and Lucent offers the Definity switch for afloat purposes. Provisions have been included for such things as special racks to be specified and included on an order as other direct costs. Contact the PMO if ViViD falls short of your afloat requirements.

Question: *I need my facility modified to host equipment I need to install. Can ViViD help?* ▶

Answer: Yes. Construction, heavy equipment and operators, electricians and more are available under ViViD. These types of labor categories use the Davis Bacon Act provisions for pricing, etc.

The prices shown in each ViViD contract are for the San Diego area. To obtain pricing for your geographic area, contact the PMO for the current rates which are based on the rates published by the Department of Labor. A formula in the contract is used to derive the correct labor rates according to location and Department of Labor indices. The PMO subscribes to a service to access this data and can assist you in determining the appropriate prices for your order.

Question: *What is outsourcing?*

Answer: One hears many definitions for this term. Anything from support services to privatization is referred to as outsourcing. Complete life-cycle support services are available, but ViViD defines outsourcing as any combination of support services and equipment provided on a fee-for-service basis. Here are some examples:

- The fee for service could be one time or on a recurring basis. Contracts (each delivery order is a contract within itself) can be negotiated for up to five years.
- Additional terms and conditions can be negotiated including, but not limited to, termination fees.
- The contractor can offer equipment already under ViViD plus equipment that is not. (ViViD defines equipment as hardware, software and/or firmware.) For example, the contractor can use assets to which he already has access, such as already installed SONET rings and mainframes and charge a fee for usage. This could be combined with the installation of a large cable plant which is paid for on a recurring basis and amortized over a five-year period. Upon completion of the contract/delivery order, title to the equipment could be transferred to the Government or retained by the contractor.

Generally, outsourcing requires a user to thoroughly understand their requirement especially if contracting for a specified quality level of service.

All outsourcing orders require the concurrence of the ViViD Contracting Office and PMO who will assist customers and share lessons learned.

Question: *Do I need approval from the PMO to order certain items under ViViD?*

Answer: The PMO will be actively monitoring all initial orders to ensure each contractor performs. Either the customer or the COMO can fax copies of orders and TRNs to the PMO. Once the PMO is assured that each contractor has a ViViD history of satisfactory or higher performance, procedures will be relaxed accordingly. Notwithstanding, the contract start up procedures, the PMO always reviews any other direct costs ordered, services orders more than $500K and the more complex orders such as outsourcing orders.

The COMO reviews every order under the guidelines of the ViViD PMO and Contracting Officers. Also, both the PMO and Contracting Officers conduct random sampling. While we don't want to impede performance or delivery, we need to ensure that DON and DoD policies and applicable rules, regulations and laws are followed. In addition, we need to monitor contractor performance and share the applicable lessons learned with the customer.

The PMO and its infrastructure are the first level of support for any audits or investigations (e.g., DoDIG, Navy Audit, Naval Criminal Investigative Service, Congressional Inquiries) regarding any Umbrella Program contract . Usually, these are successfully handled by the PMO and the customer is never bothered.

Question: *How can I get a copy of the ViViD contracts?*

Answer: Both of the ViViD contracts (Lucent and GTE) are available on the web at www.chips.navy.mil/it. Modifications will also be placed on the web along with other information that may interest ViViD customers. The ViViD contracts in total, not counting the proposals which are incorporated by reference, are about seven inches thick when printed. To save resources, the PMO will try very hard not to distribute the contracts on paper. If you don't have access to the web, the COMO can send you a CD-ROM. Any problems regarding the web should be called in to (757) 445-2111/ 2568, DSN 565 or to the PMO.

Question: *Why is there a PMO suspension on ATM products?*

Answer: We test technology that we consider an interoperability and/or integration risk. We've supported customers who have ATM equipment and have tested various ATM equipment; both have many technical problems.

Interoperability and integration problems are common with ATM equipment due to the immaturity of those products and, in some cases, the lack of approved standards. ATM equipment doesn't always perform consistently. In deed, performance can differ widely. ATM equipment will be tested by our labs, and those tests must be successfully completed prior to permitting the contractors to ship the equipment to ViViD customers.

Provisions in the ViViD contract, as well as the PC-LAN+ contract, require that contractors ensure changes in their commercial products (e.g., required to successfully interoperate with equipment under contract and DON owned equipment) are incorporated and marketed the same. This will ensure that the Government doesn't buy into a special DoD version of COTS. Technical tips regarding this equipment may be found on the web at www.chips.navy.mil/it.

For more information or a copy of the contracts see: www.chips.navy.mil/it. Visit BLII Master Plan on SPAWAR's web page at www.spawar.navy.mil/dms/

ViViD Clin List

Lucent Technologies, Inc.
N68939-97-D-0040

Equipment and services with CLIN/SCLINs and associated pricing are offered under the Lucent ViViD contract. The price listed is the first year price, reflecting all costs except where noted with an asterisk. The asterisks are approximate prices which will vary based on configuration. Ordering options include purchase, lease and lease-to-own. Prices listed below reflect the purchase price; lease and lease-to-own prices can be found in the contract or on the separate contract or Umbrella Program web page. One significant feature of the ViViD contract is the **4-year warranty for parts and labor** and an **extended 2-year parts and labor warranty** offered by the contractors.

* Price Approximate, based on configuration
** Availability subject to further testing
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CLIN	Description	Price
1000	**Small DSS** - Basic Switch for 2000 subscriber lines and 400 trunks. 80% ISDN/20% Analog. Other features and functions such as Lucent Intuity AUDIX Voice Messaging and UPS are available.	
1010	Lucent Definity ECS-R5r	1.2M*
1015	Lucent 5ESS-2000 VCDX	1.0M*
1020	Nortel Meridian 1 Option 81C	1.4M*
1200	**Medium DSS** - Basic Switch for 8000 subscriber lines and 1600 trunks. Other features and functions such as Remote Switch, Lucent Intuity AUDIX Voice Messaging and UPS are available.	
1210	Lucent Definity ECS-R5r	4.7M*
1215	Lucent 5ESS-2000	4.7M*
1220	Nortel Meridian 1 Option 81C	6.1M*
1400	**Large DSS** - Basic Switch for 35,000 subscriber lines and 7000 trunks. Other features and functions such as Remote Switch, Lucent Intuity AUDIX Voice Messaging and UPS are available.	
1415	Lucent 5ESS-2000	12.5M*
1600	Modernization of Small AT&T G2.2 (GOE) Upgrade to Lucent Definity ECS-R5r	1.0M*
1800	Modernization of Medium AT&T G2.2 (GOE) Upgrade to Lucent Definity ECS-R5r	2.4M*
2000	Modernization of Small AT&T System 75 (GOE) Upgrade to Lucent Definity ECS-R5r	1.0M*
2200	Modernization of Small AT&T G3i (GOE) Upgrade to Lucent Definity ECS-R5r	0.9M*
2400	Modernization of Medium AT&T G3r (GOE) Upgrade to Lucent Definity ECS-R5r	2.9M*
2600	Modernization of Medium AT&T 5ESS (GOE) Lucent 5ESS-2000 Version Upgrade	1.9M*
2800	Modernization of Large AT&T 5ESS (GOE) Lucent 5ESS-2000 Version Upgrade	10.2M*
3000	Modernization of Small Nortel Meridian SL-1 Opt 61 (GOE) Upgrade to Nortel Meridian 1 Opt. 81C	1.0M* 1.0M*
3200	Modernization of Medium Nortel Meridian SL-1 Opt 81 (GOE) Upgrade to Nortel Meridian 1 Opt. 81C	4.2M*
3400	Modernization of Small Nortel SL-100 NT40 (GOE) Upgrade to Nortel SL-100 SuperNode	2.6M*
3600	Modernization of Medium Nortel SL-100 NT40 (GOE) Upgrade to Nortel SL-100 SuperNode	4.9M*
3800	Modernization of Large Nortel SL-100 SuperNode (GOE) Nortel SL-100 SuperNode Version Upgrade	18.7M*
4000	**ISDN Telephone Sets**	
4000AA	Lucent Model 8510T	365.81
4000AB	Lucent Model NI-14T	380.79
4000AC	Lucent Model NI-14U	324.56
4000AD	Lucent NT1B-300 ISDN-BRI U to ISDN-BRI T Converter	91.35
4000AE	Lucent 400B2 Adapter to connect MSP power supply to an NT1 or T interface ISDN set	5.08
4000AF	Nortel Model M5317-TDX	459.00
4000AG	Lucent 32238 EPROM chip for firmware upgrade of 8500 series	61.59
4000AH	Lucent MSP-1 power supply	49.76
4005	**Analog Telephone Sets**	
4005AA	Lucent Model 8101	64.93
4600	**SONET Multiplexers**	
4635	Lucent DDM-2000 SONET OC-3 Multiplexer (R9.0)	24.1M*
4637	Alcatel Model 1603/12 (OC-3) SM SONET Multiplexer (R05.01)	28.7M*
4640	Lucent DDM-2000 SONET OC-12 Multiplexer (R11.0)	46.5M*
4643	Alcatel Model 1603/12 (OC-12) SM SONET Multiplexer (R05.01)	43.1M*
4645	Lucent FT-2000 SONET OC-48 Multiplexer (R7.1)	130.4M*
4647	Alcatel Model 1648 SM SONET OC-48 Multiplexer (R05.01)	180.8M*
4710	**Building Multi-Protocol Router**	
4710AA	Cisco Systems 7507 with 1 RSP	18,534.29
4710AC	Cisco 7507 Dual Power AC Power Supply Option, PWR/7/2	4,751.01
4710AD	Cisco 7507 IOS Enterprise Software, SW-G75A-11.2X	6,557.94
4710AE	Cisco 7500 Series Ethernet Interface Processor Card (6 AUI ports), CX-EIP6	13,115.88
4710AF	Cisco 7500 Series Multichannel Interface Processor Card (2 T1 Ports), CX-MIP-2CT1	12,296.14
4710AG	Cisco 7500 Series Token Ring Interface Processor Card (Two 4/16Mbps Ports), CX-TRIP2	9,427.04
4710AH	Cisco 7500 Series FDDI Interface Processor Card (1 port), CX-FIP-MM	14,755.37
4710AJ	Cisco 7500 Series Fast Ethernet Interface Processor Card (1 RJ45 port), CX-FEIP-1FX	9,427.04
4710AK	Cisco 7500 Series Fast Serial Interface Processor Card (4 ports, X.21, EIA 449, EIA 232, V.35, EIA 530), CX-FSIP4	7,377.68
4710AL	Cisco 7500 Series Route Switch Processor, RSP2 Includes system cpu, 16 MB DRAM, and 8 MB Flash card.	12,139.16
4710AM	Cisco 7500 Series 32-MB DRAM (Spare - Two 16 MB SIMMs), MEM-RSP-32M	3,259.80
4710AN	Cisco 7500 Series 8MB Flash Memory Card (Spare), MEM-RSP-FLC8M=	612.89
4710AP	Cisco 7500 Series Multichannel Interface Processor Card (1 E1 Port), CX-MIP-1CE1	9,448.47
4720	**Enterprise Concentrator**	
4720AA	Bay Networks 5000BH Chassis, AD1402001,	3,408.35
4720AB	AC Supplies for Redundant power, Bay Networks, 5000	682.35
4720AD	Bay Networks 5000 Supervisory Module, 5110	768.03
4720AE	Bay Networks 5000 Four Port ATM Multimode (SC) Module for 5000, CL1304002	9,288.97 **
4720AK	Bay Networks 5000 Ethernet Router Module, AD1004003	9,216.39
4720AM	Bay Networks 5000 FDDI Router Sub-Module, AD1233002	5,760.24
4720AQ	Bay Networks 5000 Etherspeed Module 14 10BaseT (RJ45) plus 2 100baseFX (SC), CL2004001	7,215.66
4720AR	Bay Networks 5000 16 MB Memory for 4720AK, AD0011006	1,003.80
4720AS	Bay System 5000 Bay Rs Lan Software Suite, AD0008002	855.08 ▶

CLIN	Description	Price
	Supports Multi-Protocol Ethernet Routing	
4720AT	Bay Networks 5000 Etherspeed Module Model 5328, 14 10BaseT and Two 10BaseT/100BaseTx (RJ45), CL2004002	6,524.44
4730	**Building Concentrators**	
4731	**Switched Hubs**	
4731AA	Bay Networks Baystack Ethernet Switch 6 10-Mbps RJ-45 ports, AL2001001	2,882.09
4731AC	Bay Networks 100BaseFX (SC) MDA for Baystack Switch, AL2019002	342.16
4731AD	Bay Networks Redundant Power Supply Unit for Stackable Products, RPSU	2,121.91
4731AH	Bay Networks Centillion Chassis, AS0002001	1,497.42
4731AJ	Bay Networks Centillion Speedview Management Software, AS0014001, 1 license per site	3,131.81
4731AL	Bay Networks Centillion Etherspeed Module 12 10BaseT plus 2 100BaseFX (10 RJ45, 2 SC) AS2004001	7,599.30
4731AN	Bay Networks Centillion 4 port TokenSpeed Module, AS1104001	3,670.27
4731AP	Bay Networks Centillion 4 port ATM Module MM (SC) W/MCP, AS1304005	7,599.30 **
4731AU	XYPLEX Network 9000 Hub 15 Slot Chassis, N9-9015-022, Includes flash card internetworking software P/N MED-IM-20	3,885.06
	4731AW XYPLEX Network 9000 720 Access Server Processor Module, N9-720-000-4 Processor for Terminal Access Server Used in SCLIN 4731AU, includes OS Ver. 6.0 P/N MED-CSK-13	1,708.00
4731AX	XYPLEX Network 9000 16 Port Telco 721 I/O Module, N9-000-721	922.64
4731AY	XYPLEX Network 9000 402 Processor with 8 meg RAM, N9-402-000-8 Multiple LAN/WAN connecting ISDN FDDI and ATM; used in SCLIN 4731AU	4,790.34 **
4731AZ	XYPLEX Network 3000/3850 Series Branch Office Hub Router equipped with 2 ISDN BRI WAN and 12 10BaseT ports, N3-3802-114141	3,320.66
4731BB	XYPLEX Network 9000 2 port T1 with DSX-1 interface and 2 integral CSUs, N9-000-472CS	7,127.77
4731BC	XYPLEX Network 9000 8 port RJ-45 ISDN BRI Module, N9-000-478	4,642.37
4731BD	Bay Networks Centillion Redundant power AC Supply, AS0005001	1,197.19
4731BE	XYPLEX Network 9000 3605 10BaseT Ethernet Repeater, N9-3605-001	840.61
4731BF	XYPLEX Managed Redundant AC Power Supply, N9-130-000	760.23
4731BG	XYPLEX Network 9000 E1 I/O Module (75 ohm G.703), N9-000-474	5,797.01
4732	**Shared Hubs**	
4732AA	Cabletron Systems SEHI-22 13 port (12 RJ45 Ports, 1 EPIM Slot) shared 10BaseT Hub	1,996.73
4732AC	Cabletron Systems SEH Accessory Kit 19" Rack Mount, SEHACCYKIT	13.93
4732AF	Cabletron Systems EPIM-F2 Multimode (1 ST) Module	324.11
4732AH	Bay Networks Baystack 10baseT Hub with 12 RJ-45 ports, CG1001E01	624.26
4732AJ	Bay Networks Baystack Ethernet Standard SNMP NMM, CG1007001	377.91
4732AK	Bay Networks Fiber Media Adapter 10BaseFL (1 ST), CG1019003	198.95
4732AL	Bay Networks Cascade Cable for BayStack Hub, AT0018001	90.69
4740	**Enterprise Firewall System**	
4740AA	Secure Computing Corp Sidewinder - DEC More than 250 Users,	35,064.61
	SW30-UL-4-DVP-B, Sidewinder 3.0 w/unlimited user license, DEC Prioris HX 6200 server, 15" Multisync Monitor, 64 MB memory, Dual PCI Fast Ethernet.	
4740AG	Secure Computing Corp, Additional Fast Ethernet Card (3+ Networks) (PCI), SWOP-FETH-A/B, Fast Ethernet Card (PCI) - 10/100 Mbps 10BaseT/100BaseTX, RJ45	203.80
4740AH	Secure Computing Corp, Multiple Network Capability (3 or 4 Networks), SWPF-UL-0-MNET, for firewalls with more than 2 NETs	3,547.00
4740AJ	Secure Computing Corporation, DMS Firewall Enhancement, PART4740AJ Sidewinder Add-on for DMS	4,433.75
4740AK	Secure Computing Corp, Fortezza Authentication Server Option (Unlimited), SWPF-UL-8-FORT, Unlimited License for Fortezza Authentication Server	5,094.90
4740AL	Secure Computing Corp, Sidewinder Hardware Platform - DEC Server, Prioris HX 6200, SWHW-D200-B, 64 MB Ram, 2GB HD, 2 GB DAT	12,124.96
4740AM	Secure Computing Corp, Sidewinder Non-Operational Standby License, SW30-SP-4, Sidewinder software licensed for use in mission critical sites where there is a desire to have a second system loaded, configured and ready to bring on-line in the event of primary system failure.	2,484.62
4750	**Multiplexer**	
4750AA	Timeplex LINK/2+ Mainframe Unit with Redundant NCL+/SL and PS/L1 Power Supplies, Link2+, L2030-E/SL, Integration of voice data and image transmission	27,619.45
4750AC	Timeplex Interlink Module for T1 Termination, Link2+, ILC.2/SL, Controls distributed communications of digital links	2,595.95
4750AE	Timeplex LINK Digital Voice Module supports 24 digital voice channels, Link2+, ILP.4, Provide voice trunking connections to digital PBX's (T1 and E1)	4,343.22
4750AG	Timeplex 4-port ADPCM/PCM voice module, Link2+, QVM.3, Provides 16kbps digital encoding of analog tie trunks	3,060.23
4750AK	Timeplex 4-port Asynchronous Data Module (RS-232), Link2+, QAM, I/O data module MIL-STD-188-114 unbalanced half duplex	2,341.35
4750AL	Timeplex 4-port Synchronous Data Module (RS-232), Link2+, QSC, I/O data module MIL-STD-188-114 unbalanced half duplex	3,155.08
4750AM	Link Management Agent, Timeplex, Link2+, 2.0, SNMP Proxy Agent allows for full control of the LINK/2 with SNMP GETS and SETS	2,895.02
4750AN	Lucent Technologies, OC3 SONET MUX, DDM2000, Equipped with baffle, fan/filter, 2 timing generators, 2 OLIU OC-3, 2 VT-STS1 MUX, 2 DS1 LSI, 6 retainer cards, OHCTL OC3, SYS controller, 3 S/W pkgs, & cables	19,999.79
4750AP	Alcatel, OC12 SONET MUX , 1603/12, Equipped with 2 clock units, element processor, 2 OC12 interfaces, 2 variable cross connect, order wire ALN, S/W, 1301 APP 1603/12, 7FT frame, 3 pwr units, pwr shelf, 2 OC3 interfaces, connection kit, 2 drop modules,	36,242.56

CLIN	Description	Price
	1301 NM,heat baffle	
4750AQ	Alcatel, OC12 MUX T1 Interface Circuits, 1603/12, OC12T1, DS1 Low speed interface	674.56
4760	**Channel Bank**	
4760AA	Newbridge Channel Bank, 3620, 94-0043-02, T1 to DSO connectivity; Basic System - Memory Module, LIM/DSX-1 Module, V.35 Data Module, T1 Tributary Module and DTU Module	2,875.81
4760AB	Newbridge-LGS Module, 3624, 90-0156-06, Programmable short loop-loop start, loop start E&M, ground start, ground start E&M, 2 CKTS EA.	184.63
4770	**Transport Switch**	
4770AA	Fore Systems ASX-1000 24 Port Expandable Backbone ATM Switch w/one switch processors w/ Fore Thought OS, Fore Systems, ASX-1000, ASX-1000/2.5AC, 24 Port Expandable Backbone ATM Switch	21,347.63 **
4770AB	Fore Systems Power Supply PS-1000/AC, PS-1000/AC, Redundant power	4,430.86 **
4770AE	Fore Systems PNNI Licensee for ASX1000 PNNI-SW-1000, PNNI-SW1000, Private network to network interface provides UNI V3.0 ATM Network signaling	2,466.11 **
4770AF	Fore Systems LANE Services for ASX1000LANE-SW-1000, LANE-SW1000, V0.4, Local area network emulatiion establishes mac-layer connection	2,466.11 **
4770AG	Fore Systems ASX-1000 2.5 Gbps Switch Module Upgrade with HA Switch Control Processor and 16 MB DRAM, Fore Systems, ASX-1000, ASX-Up.1000HA 16, 2.5 Gbps Switch Module Upgrade with HA Switch Control Processor and 16 MB DRAM	12,969.76 **
4770AJ	Fore Systems ASX-200BX 24 Backbone/Workgroup ATM Switch w/dual AC power ASX-200BX; w/ Fore Thought OS, ASX-200BX, ASX-200BX/AC, 24 Port Backbone/ Work Group ATM Switch	15,925.15 **
4770AK	Fore Systems 19" Rack Mount, Fore Systems, N/A, RM-200WG, 19" rack mount	65.87
4770AN	Fore Systems PNNI Licensee for ASX200BX PNNI-SW-200BX, PNNI-SW200BX, Private network to network interface provides UNI V3.0 ATM Network signaling	1,642.70 **
4770AP	Fore Systems 4@155 Mbps OC-3c/STM-1 Multimode Fiber ports - ST (3.0.1), NM-4/155MMSTC, Fore Systems, N/A, NM-4/155MMSTC, 4 ports at 155 Mbps ATM Interface Module ST Ports	3,267.11 **
4770AS	Fore Systems 6@1.5 Mbps ATM ports - SC (3.0.1) NM-6/DS1C, NM-6/DS1C, 6ports at 1.5 Mbps ATM Interface Module	14,017.24 **
4770AV	Fore Systems 4@155 Mbps OC-3c/STM-1 Singlemode Fiber - Short Reach- ST (3.2.0) NM-4/155SMSRC, 4 ports at 155 Mbps ATM Interface Module FC Ports	13,082.44 **
4770AW	Fore Systems LANE Services for ASX200 LANE-SW-200BX, LANE-SW200BX, V0.4, Local area network emulation establishes mac-layer connection	1,642.70 **
4780	**Microwave System**	
4780AA	Lucent Technologies, Microwave Terminal E/W:multiplexer, Mega Star 2000, AT&T MW7LTE71, SONET compatible microwave radio.	99,906.14
4780AB	Andrew Corp, Microwave Antenna 10 Ft Diameter, High Performance, HP 10-71W, High gain antenna with improved sidelobe performance & Radome	10,138.03
4780AC	UNR-ROHN, 20 ft. Straight Tower Section, 84HX11, 41 inch face width straight galvanized tower section	1,496.03
4780AD	Andrew Corp, Waveguide Elliptical, Heliax, EWP77, Premium Elliptical waveguide	13.18
4780AE	Andrew Corp., Connector Waveguide, 177DE, Waveguide Hanger	205.54
4780AF	Andrew Corp., Elliptical Waveguide Stainless Steel 10 CT Hangers for use with CLIN 0325, 42396A-11, Waveguide Fastener	31.33
4780AG	Andrew Corp, Waveguide Mounting Fasteners 10 CT Stainless Steel for use with CLIN 0325, 31769-1, Antenna Hardware	9.41
4780AH	Andrew Corp, Waveguide Tower Standoff Kit, 30848-4, Antenna Hardware	76.64
4780AJ	Andrew Corp, Waveguide Hoisting Grip, 19256-B, Antenna Hardware	30.31
4780AK	Andrew Corp, Waveguide Antenna Hardware, 35849A-16, Single Entrance Elliptical Waveguide EW77 Fitting Wall/Roof use with CLIN 0325	58.53
4780AL	Andrew Corp, Window Pressure Waveguide, 55001-112, Antenna Hardware	43.64
4780AM	Andrew Corp, Flex Twist Waveguide, WFTP-112-24-71, Antenna Hardware	356.64
4780AN	Andrew Corp, Microwave Antenna Side Strut/(Fixed), 38891A, Antenna Hardware	193.54
4780AP	Andrew Corp, Waveguide Pressure/ Dehydrator, MRSH-052-103, Pressure Dehydrator	1,086.90
4780AQ	Lucent Technologies, Lineage Cabinet Power Systems 7" Equipment Rack, H569-422-G-1, -48 VDC Redundant Power Supply W/8HR Batt.	911.99
4780AS	Lucent Technologies, Low Voltage Disconnect Panel, H569-422-G-5A, -48 VDC Redundant Power Supply Components	1,414.93
4780AT	Lucent Technologies, ES 646 Monitor & Control Panel, 107335044, -48 VDC Redundant Power Supply Components	453.65
4780AU	Lucent Technologies, 48 V Rectifier, 107076259, -48 VDC Redundant Power Supply Components	1,030.19
4780AV	Lucent Technologies, IR 40C Battery Shelf, J85504D-1 L-2, -48 VDC Redundant Power Supply Components	738.60
4780AW	Lucent Technologies, IR 40 Battery Thermal Probe, 847-198-751, -48 VDC Redundant Power Supply Components	4,921.09
4780AX	Lucent Technologies, IR 40C Battery E/W Cables, 1R40C, 407148113, 12V To Ensure Uniform Voltage Distribution	145.62
4780AZ	Lucent Technologies, ES 611 Distribution Module E/W D.C. Circuit Breakers, ES611, 107502825, -48 VDC Redundant Power Supply Components	313.16

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CLIN	Description	Price
4780BA	Lucent Technologies, Alarm Plug Cable Set, 847415874, -48 VDC Redundant Power Supply Components	3,098.76
4780BC	Andrew Corp, Elliptical Waveguide to Tower Grounding Kit for use with CLIN 0325, 241088-3, Antenna Hardware	23.34
4780BD	Andrew Corp, Microwave Antenna Side Strut/ (Adjustable Inboard), 221865, Antenna Hardware	240.91
4780BE	Lucent Technologies/Harris Far, Microwave Repeater with Multiplexer, MegaStar 2000, AT&T MW7LRW71/MW7LRE71, SONET compatible microwave radio repeater	169,707.62
4780BF	Fort Worth Tower (FWT) Inc., Tower, Self-Supported, FWT 500-3, 97-1051, 200 FT., self-supported galvanized tower w/ FAA obstruction marking	55,030.40
4781	**Network Management Server**	
4781AA	Sun Micro Systems, Network Management Server-Enterprise-3000, Enterprise-3000, E-3000-MRI, INMCS Server	11,208.78
4781AC	Sun Micro Systems, CPU Board, 2600A,	9,170.82
4781AD	Sun Micro Systems, 167MHZ CPU, 2500A,	12,227.76
4781AE	Sun Micro Systems, 256 Mbytes Memory Expansion, 7022A,	4,840.16
4781AF	Sun Micro Systems, 2.1Gbyte Disk Drive, 5153A,	1,069.93
4781AG	Sun Micro Systems, SBUS I/O Board, 2610A,	6,623.37
4781AH	Mitsubishi, 21" Color Monitor, Diamond Pro 21TX, THN9105SKTK,	1,935.04
4781AJ	Sun Micro Systems, Fast SCIS-2 Enet Card, X1053A,	1,115.78
4781AK	Sun Microsystems, SBUS Fiber Channel Adapter, 595A,	611.39
4781AL	Sun Microsystems, SPARC Storage Array, X6590A,	22,111.87
4781AM	Sun Micro Systems, Power Cord, X311L,	N/A
4781AN	Sun Micro Systems, North American Country Kit, X3540A,	N/A
4781AP	Sun Micro Systems, Solaris 2.x Server Media, SOLS-C,	89.94
4782	**Operator Workstations**	
4782AA	Sun Microsystems, Operator Workstation Sun-Ultra Enterprise- 1/170, Ultra Enterprise 1/170, A11-UBA1-9S-064CB, INMCS Workstation	13,241.65
4782AC	Sun Micro Systems, 64 MB SIMM Expansion, X7002A,	1,426.57
4782AD	Sun Micro Systems, 2.1Gbyte Disk Drive, X5175A,	917.08
4782AF	Sun Micro Systems, Internal 1.44Mbyte Floppy Drive, X6001X,	152.85
4782AG	Mitsubishi, 21" Color Monitor, Diamond Pro 21TX, THN9105SKTK,	1,935.04
4782AH	Sun Micro Systems, Solaris 2.x Server Media, SOLS-C,	89.94
4782AJ	Sun Micro Systems, North American Country Kit, X3540A,	N/A
782AK	Sun Micro Systems, Power Cord, X311L,	N/A
4783	**Peripheral Equipment**	
4783AA	HP-5M LaserJet Printer, C3917A, INMCS Printer	2,271.31
4783AB	HP-Jet Direct Card for Sun, J2593A, INMCS Printer Peripheral	539.04
4783AC	Xerox 4915 Plus Color Laser, XE-4915+	5,089.81
4784	**Software**	
4784AA	OSI, NetExpert Development, 3.X, Network Management SW	122,277.60
4784AB	OSI, NetExpert Server, 3.X, Network Management SW	75,404.52
4784AC	OSI, NetExpert Operator Workstation, 3.X, Network Management SW	26,493.48
4784AD	OSI, NetExpert Agent Package Administrator, 3.X, Network Management Software	30,569.40
4784AE	OSI, NetExpert Visual Agent, 3.X, Network Management SW	45,854.10
4784AF	OSI, NetExpert SNMP Gateway, 3.X, Network Management SW	9,170.82
4784AG	OSI, NetExpert Generic Gateway, 3.X, Network Management SW	20,379.60
4784AH	OSI, NetExpert Peer to Peer Gateway, 3.X, Network Management SW	45,854.10
4784AJ	OSI, SL-GMS Runtime, 5.X, Network Management SW	2,547.45
4784AK	OSI, SL-GMS Development, 5.X, Network Management SW	12,737.25
4784AL	OSI, NetExpert TCP/IP Protocol Agent, 3.X, Network Management SW	18,341.64
4784AM	I-Net, INMCS Integration, Part 4784AM, 1, Install, configure, test INMCS COTS products to include their ability to exchange information received from network devices & work together as a single integrated system, excludes core or custom rule sets or graphics	9,935.06
4784AN	NetExpert RuleSet for Cisco 7507, Part 4784AN, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site	12,675.43
4784AP	NetExpert RuleSet for Cisco 7513, Part 4784AP, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site	12,662.75
4784AQ	NetExpert RuleSet for Sidewinder Firewall, Part 4784AQ, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site	8,884.85
4784AR	NetExpert RuleSet for Timeplex Link2+, Part 4784AR, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site INMCS	9,296.00
4784AS	NetExpert RuleSet for DDM-2000, Part 4784AS, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site	10,517.89
4784AT	NetExpert RuleSet for Alcatel 1603/12, Part 4784AT, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site	5,916.31
4784AU	NetExpert RuleSet for MEGASTAR Microwave, Part 4784AU, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site	9,296.00
4784AV	NetExpert RuleSet for Manakon SIU,	31,343.27

CLIN	Description	Price
	Part 4784AV, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site	
4784AW	NetExpert RuleSet for Backup Generator, Part 4784AW, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site	9,296.00
4784AX	NetExpert RuleSet for Bay Networks 5000BH, Part 4784AX, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site	21,450.46
4784AY	NetExpert RuleSet for Bay Networks Ethernet Switch, Part 4784AY, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site	21,450.46
4784AZ	NetExpert RuleSet for Bay Networks Centillion 100, Part 4784AZ, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site	16,526.22
4784BA	NetExpert RuleSet for Xyplex 9000, Part 4784BA, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site	12,065.88
4784BB	NetExpert RuleSet for Xyplex 3000/3850, Part 4784BB, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site	9,296.00
4784BC	NetExpert RuleSet for Cabletron SEHI-22, Part 4784BC, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site	7,738.89
4784BD	NetExpert RuleSet for Baystack 10BT Hub, Part 4784BD, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site	12,662.75
4784BE	NetExpert RuleSet for Newbridge 3624, Part 4784BE, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site	8,329.28
4784BF	NetExpert RuleSet for Fore ASX 1000, Part 4784BF, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site	21,450.46
4784BG	NetExpert RuleSet for ASX 200BX, Part 4784BG, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site	21,450.46
4784BH	NetExpert RuleSet for ATL CSU/DSU, Part 4784BH, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site	8,692.76
4784BJ	NetExpert RuleSet for UPS, Part 4784BJ, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site	8,701.46
4784BK	NetExpert RuleSet for Windata, Part 4784BK, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site	7,738.89
4784BL	NetExpert RuleSet for Wavelan, Part 4784BL, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site	7,727.57
4784BM	NetExpert RuleSet for Enterprise 3000, Part 4784BM, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site	4,997.73
4784BN	NetExpert RuleSet for Ultra 1/140, Part 4784BN, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site	4,986.29
4784BP	NetExpert RuleSet for GPS SYNC Reciever and Equipment, Part 4784BP, Provides proxy agent functionality consisting of core rule set & generic gateway to support Fault, Configuration & Security Mgmt & Trouble Ticketing. Requires Customization Services at Each Site	7,727.57
4785	**Oracle RDBMS**	
4785AA	Oracle 7 Network License With 20 Concurrent Users for Solaris 2.X, Part 4785AA, 7.X, Central Repository RDBMS for SCLINS 7350AB-7350AD & 7400AM-7400AV	10,815.25
4785AB	Oracle Developer 2000 for Solaris 2.X, Part4785AB, 7.X, Central Repository RDBMS for SCLINS 7350AF-7350AK & 7400AW, 7400AZ, 7400BA	5,958.13
4785AD	Oracle SQL*Plus for Solaris 2.X, Part 4785AD, 7.X, Central Repository RDBMS for SCLINS 7400AN	491.96
4786	**Other Software**	
4786AA	Remedy ARS (Base License), 2.X, Trouble Ticket SW	6,623.37
4786AB	Visionael Net Design, Advanced Graphics Systems, NDU Visionael Net Design, UNIX, Design and Manage Network Configurations	12,737.25

CLIN	Description	Price
4786AC	Visionael NetDB Module, Advanced Graphics Systems, Visionael NetDB, UNIX, Network Management Database	509.49
4786AD	Visionael NetReport Module, Advanced Graphics Systems, NAU Visionael NetReport, UNIX, Defines Standard Reports and Queries	1,477.52
4786AE	VISIONAEL NetLibrary Module, Advanced Graphics Systems, NLI Visionael NetLibrary, UNIX, Network Device Library	1,528.47
4787	**PBX Management**	
4787AA	TMA, Manakon Bundle, MX-BP3-40Z, PBX Management	62,939.29
4787AB	TMA, Manakon LAN-SAT Module, MX-LSI-40Z, PBX Management	5,352.59
4787AC	TMA, Manakon DB_access Module, N/A, MX-DB1-40Z, PBX Management	5,324.19
4787AD	TMA, Switch Interrogation Unit - LAN, Model SIU-5-4, MS-LCO-20Z, PBX Management	3,664.23
4787AE	TMA, Manakon Tenant Billing, MX-SB3-40Z, Provides Billing at the Tenant Level	2,129.68
4787AF	TMA, Manakon Cost Allocation, MX-CD3-40Z, Provides Allocation of Fixed Costs	4,543.31
4788	**CSU/DSU**	
4788AA	American Technology Labs, CSU/DSU Digital Service Unit, 1544, 83300-000, Interface DTE to DDS & SNMP Manageable	680.26
4789	**Synchronized Timing**	
4789AA	TrueTime, GPS Sync. Time & Freq. Recvr (two displays and keypad), XL-DC-602, 151-602, Time and Frequency Receiver	4,356.14
4789AB	TrueTime, Disciplined High Stability Quartz Oscillator, 87-399-OSA, Provides Phased Locked output signal	2,292.71
4789AC	TrueTime, Antenna Downconverter, A-1575MS-DC, 142-401,	917.08
4789AD	TrueTime, Quad AC Amplifier (Fiber Optic and Coax) Output Distribution Module, 560, 560-5085, Provides 50ohm outputs	866.13
4789AE	TrueTime, Signal Distribution Chassis (with dual AC Power Supplies), 560-197-2, 19 inch Rack Mount Chassis and power supply	3,357.54
4789AF	TrueTime, Status Fault Monitor/Control Module, 560, 560-5087-X, Status monitor of assigned alarm signals	1,350.15
4789AG	TrueTime, Network Time Server Plug-in Module, NTS-100, 87-6003-560, Provides dual redundant Network Timing Protocol time to LAN/WAN Systems	3,051.85
4789AH	TrueTime, Analog Fault Sense Switch Unit, 560, 560-5089-X, Provides auto-switch from Prime to secondary source when Prime fails	942.56
4789AJ	TrueTime, Passive Output Interface Module, 560, 560-5141-2, Provides 6 output connectors	345.83
4789AK	TrueTime, Remote Time of Year Display, RD-2, 820-202, Numeric Display Unit	1,885.11
4789AL	TrueTime, Passive Combiner/Synthesizer/ Hex Driver Module, 560, 560-5170, Provides user programmable output clock rates	1,350.15
4790	**Base-Level Multi-Protocol Router**	
4790AA	Cisco Systems, 7513 Modular Multi-Protocol Router with 1 RSP, CISCO7513, Modular Multiprotocol 12 Slot	25,372.60
4790AC	Cisco Systems, Dual Power AC Power Supply Option, PWR-7513/2, Dual load sharing	6,111.43
4790AD	Cisco Systems, IOS Enterprise Software, SW-G75A-11.2X, 11.2X, Supports users and applications across the enterprise	6,557.94
4790AE	Cisco Systems, AIP ATM Interface Processor Card MM, 7500, CX-AIP-SM, ATM Interface Processor Card MM 1 port, SC	18,597.13 **
4790AF	Cisco Systems, Route Switch Processor, 7500, RSP2, Provides one installed Route Switch Processor for 7503 and 7513 Routers. Includes system cpu, 16 MB DRAM, and 8 MB Flash card.	12,139.16
4791	**Automatic Back-Up Generator**	
4791AA	Generac, 13.3 Liter Liquid Cooled Diesel Engine Driven Generator, SD200, J36133D18CBNNC, Meets to application Military CSA NEMA and EGSA standards	25,450.87
4791AB	Generac, GTS Automatic Transfer Switch 800 amp Rating, GTS080N, 3J2LSNB, Provides ultra reliable transfer mechanism and full set of controls for operation	6,077.92
4792	**Miscellaneous Interconnect Equipment**	492.63
4792AA	Optical Data Systems, ODS 471 10BaseT to 10BaseFL Ethernet Tranceiver, 471ST, Provide fail-safe connectivity for critical network resources	
4792AC	Optical Data Systems, ODS 467 10baseT to AUI Male EthernetTransceiver, 467, Provide fail-safe connectivity for critical network resources	83.37
4792AE	Optical Data Systems, ODS 259T Vampire to AUI Male EthernetTransceiver, 259T, Provide fail-safe connectivity for critical network resources	250.10
4792AG	Optical Data Systems, ODS 469BNC RJ45 TO BNC Ethernet Transceiver, 469BNC, Provide fail-safe connectivity for critical network resources	485.05
4792AH	Optical Data Systems, ODS 464 10BaseT to AIU Female Ethernet Transceiver, 464, Provide fail-safe connectivity for critical network resources	305.29
4793	**Uninterruptable Power Equipment**	
4793AA	American Power, APC Matrix 5000 VA MX5000XR, Uninterruptable Power 5000VA	5,319.37
4793AB	American Power, APC Electronics Module MX5000EU, Matrix, Hot swapable electronic component	1,931.75
4793AC	American Power, APC Isolation Module MX5000IU, Provides full line conditioning	2,367.47
4793AD	American Power, APC SmartCell XR Battery Packs, Matrix, SmartCell XR, Connected in parallel for max security	1,205.22
4793AF	American Power, APC Smart-UPS 1400VA, Smart-UPS, SU1400, Uninterruptable Power 1400VA	701.54
4793AG	American Power, APC Powernet SNMP Adapter 10baseT for APC700, Smart-UPS, AP9205, SNMP manageable	328.10
4793AJ	American Power, APC Powernet SNMP Adapter 10BaseT for APC700, Smart-UPS, AP9205, SNMP manageable	328.10
4793AK	American Power, APC Smart-UPS 700VA, Smart-UPS, SU700, Uninterruptable Power 700VA	408.42
4794	**Wireless Equipment**	
4794AA	Windata Airport I Wireless Interbuilding Ethernet LAN Hub Unit with Outdoor Antenna 100' cable SNMP, API-HO.3, Wireless Ethernet LAN Interbuilding Hub	9,680.31
4794AC	Windata Rack Mount Kit, Airport I, WD-HRMK, Rack mountable	69.46
4794AD	Windata Airport I Wireless Interbuilding	5,349.65

CLIN	Description	Price
	Ethernet LAN Remote Unit with Outdoor Antenna 100' cable, API-RO.3, Wireless ethernet LAN interbuilding Remote with 6' crossed 10 BaseT cable	
4794AF	Lucent Technologies WaveLAN Wireless Ethernet LAN Adapter for Desktop PC (AT/ISA) DES Encryption, 3399-K603, Wireless Ethernet LAN Intrabuilding PC Adapter	612.87
4794AH	Lucent Technologies WaveLAN Wireless Ethernet LAN Adapter for Laptop PCMCIA DES Encryption, 3399-K081, Wireless Ethernet LAN Intrabuilding Laptop Adapter	612.87
4794AJ	Lucent Technologies WavePOINT Wireless Ethernet LAN Ethernet access point, 3105-0101, Wireless Ethernet LAN Intrabuilding access 1 RJ45 port	1,238.33
4794AL	Lucent Technologies, WaveLAN Security Feature Kit for WavePOINT, 3299-K972,	69.75
5600	**Migration to Objective Environment**	
5610	**Pairgain, Campus T1 Stand-Alone**	
5610AA	PairGain Campus T1 stand-alone Unit, Campus-T1, 150-1150-01, 1.544 mbps HDSL Transmission System	1,953.31
5610AB	PairGain REX/T1 Ethernet Interface Card, REX/T1, 150-1171-01, Etherner Interface to Campus T1	603.36
5620	**Fiber Optic Modem**	
5620AA	RAD Data Communications, Fiber Optic Modem, FOM40/115/ST13/V35, 56 kb/s to 2.048 mb/s Modem with V35 interface and ST Optical Connector	1,750.74
5620AB	RAD Data Communications, Fiber Optic Modem, FOM40/115/FC85/V36, 56 kb/s to 2.048 mb/s Modem with V36(RS-449) interface and FC/PC Optical Connector	875.37
5620AC	RAD Data Communications, Fiber Optic Modem, FOM40/115/SM85/530, 56 kb/s to 2.048 mb/s Modem with RS-530 interface and SMA Optical Connector	875.37
5620AD	RAD Data Communications, Fiber Optic Modem, FOM-E1T1/ST13/115, 1.544 mb/s to 2.048 mb/s Modem with G.703 interface and ST Optical Connector	1,591.59
5620AE	RAD Data Communications, Fiber Optic Modem, FOM-E1T1/FC85/115, 1.544 mb/s to 2.048 mb/s Modem with G.703 interface and FC Optical Connector	779.88
5620AF	RAD Data Communications, Fiber Optic Modem, FOM-E1T1/SM85/115, 1.544 mb/s to 2.048 mb/s Modem with G.703 interface and SMA Optical Connector	779.88
5620AG	RAD Data Communications, Fiber Optic Modem, FOMT3/ST13/115, 44.736 mb/s Modem with G.703 interface and ST Optical Connector	3,024.01
5620AH	RAD Data Communications, Fiber Optic Modem, FOME3/ST13/115, 34.368 mb/s Modem with G.703 interface and ST Optical Connector	1,671.17
5620AJ	RAD Data Communications, Fiber Optic Modem, FOM-STS1/ST13/115, 51.84 mb/s Modem with G.703 interface and ST Optical Connector	3,620.86
5620AK	RAD Data Communications, ATM Media Converter (Chassis Unit), AMC-101/AC Electrical to Optical Media Converter chassis unit with power supply.	835.58 **
5620AL	RAD Data Communications, Optical Module for AMC-101, AMC-M/SM/ST/13/R, Optical Module for AMC-101 Data Rates OC-1 to OC-3 with ST Optical Connector.	756.00
5620AM	RAD Data Communications, Electrical Module for AMC-101, AMC-M/UTP/155/R, Electrical Module supporting STS-3C interface.	397.90
5620AN	RAD Data Communications, Modem Nest for 19" Rack, ASM-MN-214/115, Nest for mounting up to 14 Modem Cards; E/W Power Supply.	477.48
5620AP	RAD Data Communications, Fiber Optic Modem Card Version, FOM-E1T1R/ST13/115, 1.544 or 2.048 mb/s MODEM with G.703 interface and ST Optical Connector Card Version.	512.01
5630	**Timeplex TX3 Superhub**	
5630AA	Timeplex, Redundant Main Shelf, TX3, TX3-B1R+,19" Main Shelf W/2 Controllers 2 Power Converters and Alarm Relay	11,742.72
5630AB	Timeplex, Redundant Expansion Shelf, TX3-M1R+, 19" Expansion Shelf with 2 Power Converters.	5,934.16
5630AC	Timeplex, Timing Generators, TX3-TM, Derives Synchronous Timing for TX3 from 1 OF 13 possible sources	2,242.15
5630AD	Timeplex, 1 X 1 Cross Connect Module (DS1 Service Module), TX3-C1/1V, Terminate 4 DS1 Signals. Cross connects between any DS1s on TX3.	4,485.38
5630AE	Timeplex, DS1 line Interface Unit with DS1 Cable, TX3-L1/7+, Provides electrical interface to DS1 signal. Provides DS1 signal interface for 7 DS1 1x1 cross connect modules +1 standby 1x1cross connect module.	2,099.16
5630AF	Timeplex, DS1 Jack Panel, TX3-IP1, Provides line (incoming) drop (outgoing) and Mon connections for 24 DS1 signals.	1,534.00
5630AG	Timplex, TX Management S/W, TX3-3000, Manages TX3 Cross Connect Map, Runs on Sun OS or Solaris 1.1	4,480.90
5630AH	Timeplex, Customer Craft Interface Device Software, SA-CID, Craft maintenance interface software runs on PC.	1,233.94
5640	**N.E.T.**	
5640AA	N.E.T. Federal, IDNX Micro20 Digital Voice Bundle RCE MIRCO20 with QASD data card trunk card trunk 3 with T1/DSX1/F PRC module, IDNX/Micro20, 1623B, Multiservice Bandwidth Manager and Multiplexer with T1 Trunk Card 4 port v.35 data card.	16,234.18
5640AB	N.E.T. Federal, IDNX Memory Module, 7213A-0204, RAM Memory Module	3,935.56
5640AC	N.E.T. Federal, IDNX Extended Memory Module, 7223A-0204, RAM Memory Expansion	3,935.56
5640AD	N.E.T. Federal, IDNX QAVP Analog Module, 3050B, 4 Port (4 W E&M) Voice Module	3,443.61
6000	**Pigtail Assembly**	
6000AA	Glenair, Pigtail Assembly, ABC54734, Manufactured using commercial equivalents of MIL-SPEC parts	1,850.58
6001	**Basic Termination for Plug Connector - Umbilical Assembly**	
6001AA	Glenair, Basic Termination for Connector plugs - umbilical Assembly, ABC54733, Manufactured using commercial equivalents of MIL-SPEC parts	2,727.40
6002	**Shore-to-Ship Fiber Cabling**	
6002AA	Chromatic Technologies, Fiber Optic Cable 6mm/2sm, H1240-S507T-08, Low smoke zero halogen outer jacket (Price is per foot)	3.25
6003	**Waterproof Fiber Optic Patch Panel Enclosure**	
6003AA	NMP, Fiber Optic Interconnection Box, 11401-101, Weatherproof tactical interconnection box, including dripshield P/N 11801-1 which is attached to box at installation	710.55

CLIN	Description	Price
6003AB	NMP, 48 ST Coupler Patch Panel, 11254-101, Patch for weather proof enclosure supports up to 48 ST couplers	131.46
6003AC	NMP, ROX Inserts, RM 20, Mechanical cable entrance sealing system for CLIN6003AA	3.21
6010	**T-1 Access to DSS (Access)**	
6010	DID T-1 Access to DSS (Access), Service Provider MTHLY Refer to the Ordering Guide for individual state pricing	
6011	DOD T-1 Access to DSS (Access), Service Provider MTHLY Refer to the Ordering Guide for individual state pricing	
6012	FX DOD T-1 Access to DSS (Access), Service Provider MTHLY Refer to the Ordering Guide for individual state pricing	
6013	FX DID T-1 Access to DSS (Access), Service Provider MTHLY Refer to the Ordering Guide for individual state pricing	
6020	**Analog Trunks (Access)**	
6020	DID Analog Trunk Access to DSS, Service Provider MTHLY Refer to the Ordering Guide for individual state pricing	
6021	DOD Analog Trunk Access to DSS, Service Provider MTHLY Refer to the Ordering Guide for individual state pricing	
6022	FX DOD Analog Access to DSS, Service Provider MTHLY Refer to the Ordering Guide for individual state pricing	
6023	FX DID Analog Trunk Access to DSS, Service Provider MTHLY Refer to the Ordering Guide for individual state pricing	
6030	**Centrex (Access)**	
6030	Digital Switching Services - Analog, Service Provider MTHLY Refer to the Ordering Guide for individual state pricing	
6031	Digital Switching Services - ISDN, Service Provider MTHLY Refer to the Ordering Guide for individual state pricing	
6050	**1FB/1MB Lines (Access)**	
6050	1FB Lines (Access), Service Provider MTHLY Refer to the Ordering Guide for individual state pricing	
6100	**Fixed 1MB Monthly-(Unlimited Calls) (Local Usage)**	
6100	Fixed Monthly-Unlimited Calls (Local Usage), Service Provider MTHLY Refer to the Ordering Guide for individual state pricing	
6150	**Measured (Per Call) (Local Usage)**	
6150	Measured (Per Call) (Local Usage), Service Provider PER CALL Refer to the Ordering Guide for individual state pricing	
6200	**Directory Assistance (411) (Local Usage)**	
6200	Directory Assistance (411) (Local Usage), Service Provider PER CALL Refer to the Ordering Guide for individual state pricing	
6300-6405	**Warranty** Standard 4 years Parts and Labor Extended 2 years Parts and Labor For additional Warranties see the Ordering Guide	
6500	**Communications Curriculum**	
6500AA	Lucent Technologies, Communications Overview, SA3001, Length of Course 3 Days, Frequency As Requested	592.62
6500AB	Lucent Technologies, LAN Users Training, SA3005, Length of Course 2 Days, Frequency As Requested	393.72
6500AC	Lucent Technologies, Information Protection Network, Building Internet Firewalls, SA5010, Length of Course 5 Days, Frequency As Requested	1,123.02
6500AD	Lucent Technologies, ATM Configuration, and Management, SA3026CU, Length of Course 5 Days, Frequency As Requested	1,199.52 **
6550	**Administration Curriculum**	
6550AA	Lucent Technologies, Network Management System - Basic, SA3003, Length of Course 5 Days, Lucent Technologies Training Centers, Frequency Quarterly	990.42
6550AB	Lucent Technologies, Network Management System - Advanced, SA3004, Length of Course 5 Days, Lucent Technologies Training Centers, Frequency As Requested	1,142.40
6550AC	Lucent Technologies, 5ESS-2000 Switch Architecture, ES5010, Length of Course 5 Days, Chicago, IL, Altamonte Springs, FL, Irvine, CA, Frequency Quarterly	2,065.50
6550AD	Lucent Technologies, 5ESS-2000 Switch Translation: Essentials for Recent Change, ES505A, Length of Course 4 Days, Chicago, IL, Altamonte Springs, FL, Irvine, CA, Frequency Quarterly	1,836.00
6550AE	Lucent Technologies, 5ESS-2000 Switch Translation: Recent Changes for Business Applications, ES505B, Length of Course 5 Days, Chicago, IL, Altamonte Springs, FL, Irvine, CA, Frequency Quarterly	2,295.00
6550AF	Lucent Technologies, 5ESS-2000 Switch Translation: Recent Changes for Routing, Charging and Digit Analysis, ES505D, Length of Course 3 Days, Chicago, IL, Altamonte Springs, FL, Irvine, CA, Frequency Quarterly	1,377.00
6550AG	Lucent Technologies, 5ESS-2000 Switch Translation: Recent Changes for Trunks, ES505E, Length of Course 2 Days, Chicago, IL, Altamonte Springs, FL, Irvine, CA, Frequency Quarterly	918.00
6550AH	Lucent Technologies, Definity ECS Administration, BTC120H, Length of Course 5 Days for Lucent Technologies Training Centers, Frequency Quarterly	1,683.00
6550AJ	Lucent Technologies, Definity ECS World Class Routing Administration, BTC123H, Length of Course 2.5 Days, for Lucent Technologies Training Centers, Frequency Quarterly	1,147.50
6550AL	Nortel, SL-100 Translations I, 500, Length of Course 10 Days, Richardson, TX, La Palma, CA, Parsippany, NJ, Raleigh, NC, Sacramento, CA, Frequency Quarterly	3,116.10
6550AM	Nortel, SL-100 Translations II, 502, Length of Course 3 Days, Richardson, TX, La Palma, CA, Parsippany, NJ, Raleigh, NC, Sacramento, CA, Frequency Quarterly	953.70
6550AN	Nortel, Meridian 1 Options 111-211 Feature Activation and Assignment, 506, Length of Course 4 Days, Richardson, TX, La Palma, CA, Parsippany, NJ, Raleigh, NC, Sacramento, CA, Frequency Quarterly	1,264.80
6550AP	Nortel, X11 Basic Database Administration, 300, Length of Course 7 Days, Richardson, TX, La Palma, CA, Parsippany, NJ, Frequency Quarterly	2,361.30
6550AQ	Nortel, Meridian Administration Tools, 383, Length of Course 3 Days, Richardson, TX, La Palma, CA,	1,127.10

CLIN	Description	Price
	Parsippany, NJ, Frequency Quarterly	
6550AR	Nortel, Meridian 1 ISDN PRI Applications and Feature Administration, 390, Length of Course 5 Days, Richardson, TX, La Palma, CA, Parsippany, NJ, Frequency Quarterly	1,887.00
6550AS	Lucent Technologies, Intuity Messaging Solutions Administration, BTC129H, Length of Course 5 Days, Lucent Technologies Training Centers, Frequency Quarterly	1,632.00
6550AT	Lucent Technologies, Intuity AUDIX and DEFINITY AUDIX Networking Administration, BTC127H, Length of Course 2 Days, OEM Certified Course Lucent Technologies Training Centers, Frequency Quarterly	816.00
6550AU	Bay Networks, Router Configuration & Management, AV0030090, Length of Course 4 Days, Santa Clara,CA, Dallas TX, Tampa,FL, Washington,DC, Frequency Quarterly	1,535.10
6550AV	Fore Systems, ATM Enterprise Edge Products, SUP-TRAIN/INTRO, Length of Course 4 Days, TBD, Frequency Quarterly	2,427.60**
6550AW	Fore Systems, ForeView Network Management, SUP-TRAIN/FV, Length of Course 2 Days, TBD, Frequency Quarterly	1,213.80
6550AX	Automation Research Systems, Limited, Introduction to Cisco Router Configuration, TRN-ICRC, Length of Course 5 Days, Washington,DC, Tampa,FL, San Francisco,CA, Detriot, MI, Edison,NJ, Frequency Quarterly	1,660.56
6550AY	Automation Research Systems, Limited, Advanced Cisco Router Configuration, TRN-ACRC, Section I, Length of Course 5 Days, Washington,DC, Tampa,FL, San Francisco, CA, Denver,CO , Edison,NJ, Frequency Quarterly	1,732.98
6550AZ	Secure Computing, Sidewinder System Administrator, SWTR-A3S-0, Length of Course 3 Days, Roseville,MI, Concord, CA, Vienna,VA, San Antonio,TX, and Lucent Facilities, Frequency Quarterly	1,091.40
6600	**Installation and Maintenance Curriculum**	
6600AA	Lucent Technologies, Introduction to the 5ESS-2000 Switch, ES5551, Length of Course 4 Days, OEM Certified Course , Dallas, TX, Altamonte Springs, FL, Irvine, CA, Frequency Quarterly	2,065.50
6600AB	Lucent Technologies, 5ESS-2000 Switch Maintenance, ES5554, Length of Course 9 Days, OEM Certified Course , Dallas, TX, Altamonte Springs, FL, Irvine, CA, Frequency Quarterly	3,717.90
6600AC	Lucent Technologies, 5ESS-2000 Switch Maintenance Hands-On, ES5555, Length of Course 10 Days, OEM Certified Course, Dublin, OH, Altamonte Springs, FL, Irvine, CA, Frequency Monthly	4,590.00
6600AD	Lucent Technologies, 5ESS-2000 Switch Translations, ES5561, Length of Course 9 Days, Dallas, TX, Altamonte Springs, FL, Irvine, CA, Frequency Monthly	3,717.90
6600AE	Lucent Technologies, 5ESS Switch Equipment Installation and Verification, ES5400, Length of Course 10 Days, Dallas, TX, Altamonte Springs, FL, Irvine, CA, Frequency Quarterly	3,264.00
6600AF	Lucent Technologies, 5ESS Switch Installation and Testing Hands-On, ES5410, Length of Course 10 Days, Dublin, OH, Altamonte Springs, FL, Irvine, CA, Frequency Quarterly	3,672.00
6600AG	Lucent Technologies, 5ESS Switch Installation System Test, ES5420, Length of Course 10 Days, OEM Certified Course, Dublin, OH, Altamonte Springs, FL, Irvine, CA, Frequency Quarterly	3,672.00
6600AJ	Nortel, Introduction to Meridian 1 Options 111-211, 400, Length of Course 4 Days, OEM Certified Course, Richardson, TX, La Palma, CA, Parsippany, NJ, Raleigh, NC, Sacramento, CA, Frequency Quarterly	1,173.00
6600AK	Nortel, Meridian 1 Options 111-211 Maintenance, 441, Length of Course 20 Days,Richardson, TX, La Palma, CA, Parsippany, NJ, Raleigh, NC, Sacramento, CA, Frequency Quarterly	6,165.90
6600AL	Nortel, Meridian 1 Options 111-211 Provisioning, 470, Length of Course 10 Days, Richardson, TX, La Palma, CA, Parsippany, NJ, Raleigh, NC, Sacramento, CA, Frequency Monthly	402.90
6600AM	Nortel, Integrated Services Digital Network Overview, 504, Length of Course 1 Days, Richardson, TX, La Palma, CA, Parsippany, NJ, Frequency Monthly	953.70
6600AN	Nortel, SuperNode Operations, 645, Length of Course 3 Days, OEM Certified Course, Richardson, TX, La Palma, CA, Parsippany, NJ, Frequency Quarterly	1,249.50
6600AP	Nortel, Meridian 1 Option 21-81 Maintenance, 240, Length of Course 5 Days, OEM Certified Course, Richardson, TX, La Palma, CA, Parsippany, NJ, Frequency Quarterly	2,228.70
6600AQ	Nortel, Meridian 1 Options 51C, 61C and 81 Maintenance and Upgrades, 253, Length of Course 4 Days, Richardson, TX, La Palma, CA, Parsippany, NJ, Frequency Quarterly	1,519.80
6600AR	Nortel, Meridian 1 Digital Interface Products, 261, Length of Course 3 Days, OEM Certified Course, Richardson, TX, La Palma, CA, Parsippany, NJ, Frequency Quarterly	1,076.10
6600AS	Nortel, Meridian 1 ISDN PRI Installation and Maintenance, 262, Length of Course 3 Days, OEM Certified Course, Richardson, TX, La Palma, CA, Parsippany, NJ, Frequency Quarterly	1,122.00
6600AT	Nortel, Meridian 1 Options 21-81 Installation and Maintenance, 263, Length of Course 10 Days, OEM Certified Course, Richardson, TX, La Palma, CA, Parsippany, NJ, Frequency Quarterly	4,268.70
6600AU	Nortel, Meridian 1 ISDN BRI Installation and Maintenance, 265, Length of Course 5 Days, OEM Certified Course, Richardson, TX, La Palma, CA, Parsippany, NJ, Frequency Quarterly	1,351.50
6600AV	Lucent Technologies, Definity Enterprise Communications Server Generic 3I/S/VS Installation and Maintenance, BTT213H, Length of Course 10 Days, Lucent Technologies Training Centers, Frequency Quarterly	5,100.00
6600AW	Nortel, Meridian 1 Options 11-81 Familiarization, 200, Length of Course 3 Days, OEM Certified Course, Richardson, TX, La Palma, CA, Parsippany, NJ, Frequency Quarterly	1,188.30
6600AX	Lucent Technologies, Intuity Messaging	3,060.00 ▶

CLIN	Description	Price
	Solutions Installations and Maintenance, BTT506H, Length of Course 5 Days, OEM Certified Course, Lucent Technologies Training Centers, Frequency Quarterly	
6600AZ	Lucent Technologies, G3r Installation and Maintenance Definity ECS, BTT216H, Length of Course 5 Days, OEM Certified Course, Lucent Technologies Training Centers, Frequency Quarterly	3,213.00
6600BA	Lucent Technologies, Engineering Training for the J85500A-2 Battery Plant, PWR5001-E, Length of Course 3 Days, OEM Certified Course, Lucent Technologies Training Centers, Frequency Quarterly	1,224.00
6600BB	Lucent Technologies, Engineering Training for the J85500G-2 Battery Plant, PWR7001-E, Length of Course 2 Days, OEM Certified Course, Lucent Technologies Training Centers, Frequency Quarterly	816.00
6600BC	Bay Networks, Hub Connectivity, AV0029196, Length of Course 4 Days, Santa Clara,CA, Dallas TX, Tampa,FL, Alexandria,VA, Philadelphia,PA, Frequency Quarterly	1,624.86
6600BD	Bay Networks, Router Installation and Basic Configuration, AV0030080, Length of Course 3 Days, Santa Clara,CA, Dallas TX, Tampa,FL, Washington,DC, Frequency Quarterly	1,150.56
6600BE	Bay Networks, Router Troubleshooting, AV0030207, Length of Course 3 Days, Billerica,MA, Atlanta,GA, Rosemount,IL, Frequency Quarterly	1,150.56
6600BF	Automation Research Systems, Limited, Installing and Maintaining Cisco Router, TRN-IMRC, Section I, Length of Course 3 Days, Washington,DC, Frequency Quarterly	1,444.32
6600BG	Whittaker Xyplex, 20/20 for UNIX, NM999, Length of Course 5 Days, Customer Site, Frequency As Required	649.74
6600BH	Secure Computing, Sidewinder Installers Training/Certification, SWTR-A5S-0, Length of Course 5 Days, Roseville,MI, Concord, CA, Vienna,VA, San Antonio,TX, and Lucent Facilities, Frequency Quarterly	1,680.96
6650	**Operations Curriculum**	
6650AA	Lucent Technologies, Introduction to the 5ESS-2000 Switch, ES5551, Length of Course 4 Days, OEM Certified Course, Dallas, TX, Altamonte Springs, FL, Irvine, CA, Frequency Quarterly	2,065.50
6650AB	Lucent Technologies, 5ESS-2000 Switch Maintenance, ES5554, Length of Course 9 Days, OEM Certified Course, Dallas, TX, Altamonte Springs, FL, Irvine, CA, Frequency Quarterly	3,717.90
6650AC	Lucent Technologies, 5ESS-2000 Switch Maintenance Hands-On, ES5555, Length of Course 10 Days, OEM Certified Course, Dublin, OH, Altamonte Springs, FL, Irvine, CA, Frequency Monthly	4,590.00
6650AD	Lucent Technologies, 5ESS-2000 Switch Translations, ES5561, Length of Course 9 Days, Dallas, TX, Altamonte Springs, FL, Irvine, CA, Frequency Monthly	3,717.90
6650AE	Lucent Technologies, Definity G3: How To Use Your Voice Terminal (Videotape Courseware), BTC525V, Length of Course Self Paced, Customer Site, Frequency As Requested	255.00
6650AF	Nortel, Meridian 1 Options 111-211 ISDN PRI Operations, 508, Length of Course 4 Days, Richardson, TX, La Palma, CA, Parsippany, NJ, Frequency As Quarterly	943.50
6650AG	Nortel, Integrated Services Digital Network (ISDN) Basic Rate Interface (BRI) Operations, 565, Length of Course 4 Days, Richardson, TX, La Palma,CA, Parsippany, NJ, Frequency Quarterly	1,259.70
6650AH	Nortel, ISDN Servord and Feature Activation, 566, Length of Course 3 Days, Richardson, TX, La Palma, CA, Parsippany, NJ, Raleigh, NC, Sacramento, CA, Frequency Quarterly	1,264.80
6650AJ	Nortel, Meridian 1 Options 111-211 Traffic Analysis, 581, Length of Course 4 Days, Richardson, TX, La Palma, CA, Parsippany, NJ, Raleigh, NC, Sacramento,CA, Frequency Quarterly	1,254.60
6650AK	Nortel, Meridian 1 Options 111-211 Maintenance-Related Operational Measurements, 582, Section I, Length of Course 3 Days, Richardson, TX, La Palma, CA, Parsippany, NJ, Raleigh, NC, Sacramento, CA, Frequency Quarterly	688.50
6650AL	Nortel, Meridian Data Services Installation, Operations and Maintenance, 260, Length of Course 5 Days, Richardson, TX, La Palma, CA, Parsippany, NJ, Frequency Quarterly	1,259.70
6650AM	Nortel, X11 Station Moves, Adds and Changes, 301, Length of Course 4 Days, Richardson, TX, La Palma, CA, Parsippany, NJ, Frequency Quarterly	1,443.30
6650AN	Nortel, Meridian 1 Options 21-81 Database for Technicians, 302, Length of Course 5 Days, Richardson, TX, La Palma, CA, Parsippany, NJ, Frequency Quarterly	1,759.50
6650AP	Nortel, Meridian 1 Options 111-211 Operational Measurement Implementation, 580, Length of Course 3 Days, Richardson, TX, La Palma, CA, Parsippany, NJ, Raleigh, NC, Sacramento, CA, Frequency Quarterly	933.30
6650AQ	Fore Systems, ASX Configuration and Operation, SUP-TRAIN/ATM, Length of Course 2 Days, TBD, Frequency Quarterly	1,213.80 **
6650AR	Whittaker Xyplex, Enterprise Hub, EH999, Length of Course 5 Days, Customer Site, Frequency As Required	1,440.24
6700	**On-the-Job Training (OJT) Orientation and Operations Curriculum**	
6700AA	Lucent Technologies, Definity G3: How To Use Your Voice Terminal (Videotape Courseware), BTC525V, Section I, Length of Course Self Paced, Customer Site, Frequency As Requested	255.00
6700AB	Lucent Technologies, 5ESS-2000 Switch ISDN Maintenance Hands-On, ES5591, Length of Course Varies, Customer Site, Frequency As Requested	2,295.00
6700AC	Lucent Technologies, End User Training, Dial Service Assistance, PEC1400-000, Length of Course Varies, Customer Site, Frequency As Requested	816.00
6700AD	Lucent Technologies, 5ESS-2000 Switch ISDN/CPE Terminal and Feature Operation, ES5745, Length of Course Varies, Customer Site, Frequency As Requested	1,239.30
6700AE	Lucent Technologies, ECICM Customer Training, Length of Course Varies, Customer Site, Frequency As Requested	510.00
8000	**CP Non-Cable Plant, Non-Switching Systems**	
8001	Principal Period of Maintenance (PPM) (CONUS)	76.50
8002	Outside the Principal Period of Maintenance (OPPM) (CONUS)	96.90
8003	SAT-SUN (CONUS)	96.90
8004	HOL (CONUS)	96.90
8005	Principal Period of Maintenance (PPM) (OCONUS)	110.93
8006	Outside the Principal Period of	139.74

CLIN	Description	Price
	Maintenance (OPPM) (OCONUS)	
8007	SAT-SUN (OCONUS)	139.74
8008	HOL (OCONUS)	139.74
8010	**GOE Non-Cable Plant, Non-Switching Systems**	
8011	Principal Period of Maintenance (PPM) (CONUS)	76.50
8012	Outside the Principal Period of Maintenance (OPPM) (CONUS)	96.90
8013	SAT-SUN (CONUS)	96.90
8014	HOL (CONUS)	96.90
8015	Principal Period of Maintenance (PPM) (OCONUS)	110.93
8016	Outside the Principal Period of Maintenance (OPPM) (OCONUS)	139.74
8017	SAT-SUN (OCONUS)	139.74
8018	HOL (OCONUS)	139.74
8020	**GOE Non-ISDN Capable Switching Systems**	
8021	Principal Period of Maintenance (PPM) (CONUS)	73.44
8022	Outside the Principal Period of Maintenance (OPPM) (CONUS)	91.80
8023	SAT-SUN (CONUS)	91.80
8024	HOL (CONUS)	91.80
8025	Principal Period of Maintenance (PPM) (OCONUS)	106.08
8026	Outside the Principal Period of Maintenance (OPPM) (OCONUS)	133.62
8027	SAT-SUN (OCONUS)	133.62
8028	HOL (OCONUS)	133.62
8030	**GOE ISDN Capable Switching Systems**	
8031	Principal Period of Maintenance (PPM) (CONUS)	76.50
8032	Outside the Principal Period of Maintenance (OPPM) (CONUS)	96.90
8033	SAT-SUN (CONUS)	96.90
8034	HOL (CONUS)	96.90
8035	Principal Period of Maintenance (PPM) (OCONUS)	110.93
8036	Outside the Principal Period of Maintenance (OPPM) (OCONUS)	139.74
8037	SAT-SUN (OCONUS)	139.74
8038	HOL (OCONUS)	139.74
8040	**CP Digital Switching Systems**	
8041	Principal Period of Maintenance (PPM) (CONUS)	76.50
8042	Outside the Principal Period of Maintenance (OPPM) (CONUS)	96.90
8043	SAT-SUN (CONUS)	96.90
8044	HOL (CONUS)	96.90
8045	Principal Period of Maintenance (PPM) (OCONUS)	110.93
8046	Outside the Principal Period of Maintenance (OPPM) (OCONUS)	139.74
8047	SAT-SUN (OCONUS)	139.74
8048	HOL (OCONUS)	139.74
8050	**Cable Plant Maintenance**	
8051	Principal Period of Maintenance (PPM) (CONUS)	73.44
8052	Outside the Principal Period of Maintenance (OPPM) (CONUS)	91.80
8053	SAT-SUN (CONUS)	91.80
8054	HOL (CONUS)	91.80
8055	Principal Period of Maintenance (PPM) (OCONUS)	106.08
8056	Outside the Principal Period of Maintenance (OPPM) (OCONUS)	133.62
8057	SAT-SUN (OCONUS)	133.62
8058	HOL (OCONUS)	133.62
8100	**CP Non-Cable Plant, Non-Switching Systems**	
8101	Principal Period of Maintenance (PPM) (CONUS)	114.75
8102	Outside the Principal Period of Maintenance (OPPM) (CONUS)	145.35
8103	SAT-SUN (CONUS)	145.35
8104	HOL (CONUS)	145.35
8105	Principal Period of Maintenance (PPM) (OCONUS)	166.39
8106	Outside the Principal Period of Maintenance (OPPM) (OCONUS)	209.61
8107	SAT-SUN (OCONUS)	209.61
8108	HOL (OCONUS)	209.61
8110	**GOE Non-Cable Plant, Non-Switching Systems**	
8111	Principal Period of Maintenance (PPM) (CONUS)	114.75
8112	Outside the Principal Period of Maintenance (OPPM) (CONUS)	145.35
8113	SAT-SUN (CONUS)	
8114	HOL (CONUS)	145.35
8115	Principal Period of Maintenance (PPM) (OCONUS)	166.39
8116	Outside the Principal Period of Maintenance (OPPM) (OCONUS)	209.61
8117	SAT-SUN (OCONUS)	209.61
8118	HOL (OCONUS)	209.61
8120	**GOE Non-ISDN Capable Switching Systems**	
8121	Principal Period of Maintenance (PPM) (CONUS)	110.16
8122	Outside the Principal Period of Maintenance (OPPM) (CONUS)	137.70
8123	SAT-SUN (CONUS)	137.70
8124	HOL (CONUS)	137.70
8125	Principal Period of Maintenance (PPM) (OCONUS)	159.12
8126	Outside the Principal Period of Maintenance (OPPM) (OCONUS)	200.43
8127	SAT-SUN (OCONUS)	200.43
8128	HOL (OCONUS)	200.43
8130	**GOE ISDN Capable Switching Systems**	
8131	Principal Period of Maintenance (PPM) (CONUS)	114.75
8132	Outside the Principal Period of Maintenance (OPPM) (CONUS)	145.35
8133	SAT-SUN (CONUS)	145.35
8134	HOL (CONUS)	145.35
8135	Principal Period of Maintenance (PPM) (OCONUS)	166.39
8136	Outside the Principal Period of Maintenance (OPPM) (OCONUS)	209.61
8137	SAT-SUN (OCONUS)	209.61
8138	HOL (OCONUS)	209.61
8140	**CP Digital Switching Systems**	
8141	Principal Period of Maintenance (PPM) (CONUS)	114.75
8142	Outside the Principal Period of Maintenance (OPPM) (CONUS)	145.35
8143	SAT-SUN (CONUS)	145.35
8144	HOL (CONUS)	145.35
8145	Principal Period of Maintenance (PPM) (OCONUS)	166.39
8146	Outside the Principal Period of Maintenance (OPPM) (OCONUS)	209.61
8147	SAT-SUN (OCONUS)	209.61
8148	HOL (OCONUS)	209.61
8150	**Cable Plant Maintenance**	
8151	Principal Period of Maintenance (PPM) (CONUS)	110.16
8152	Outside the Principal Period of Maintenance (OPPM) (CONUS)	137.70
8153	SAT-SUN (CONUS)	137.70
8154	HOL (CONUS)	137.70
8155	Principal Period of Maintenance (PPM) (OCONUS)	159.12
8156	Outside the Principal Period of Maintenance (OPPM) (OCONUS)	200.43
8157	SAT-SUN (OCONUS)	200.43
8158	HOL (OCONUS)	200.43

Lucent Technologies, Inc.: http://www.lucent.com/vivid, 1-888-VIVID4U

Navy IT Umbrella Program Website:
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GTE Government Corp. Worldwide Telecommunications Service N68939-97-D-0041

Equipment and services with CLIN/SCLINs and associated pricing offered under GTE ViViD contract. Price listed is the first year price and the price reflects all costs except where noted with an asterisk. The asterisks are approximate prices which will vary based on configuration. Ordering options include purchase, lease and lease-to-own. Prices listed below reflect the purchase price; lease and lease-to-own prices can be found in the contract or on the separate contract or Umbrella Program web page. One significant feature of the ViViD contract is the 4 year warranty for parts and labor and an extended 2 year parts and labor warranty offered by the contractors

* Price Approximate, based on configuration
** Availability subject to further testing

CLIN/ SCLIN	DESCRIPTION	PRICE
1000	**Small DSS** - basic switch for 2000 subscriber lines and 400 trunks. 80% ISDN/20% Analog. (*approx. based on Other features and functions such as Nortel Mail Option are available. configuration)	
1005	Nortel MSL-1	1.0 M*
1010	Nortel SL-100	2.1 M*
1015	Lucent 5ESS-VCDX	1.1 M*
1020	REDCOM IGX-2000	2.8 M*
1200	**Medium DSS** - basic switch for 8,000 subscriber lines and 1,600 trunks. Other features and functions such as Remote Switch, Nortel Mail Option, Nortel Message Service are available.	
1205	Nortel MSL-1	2.2 M*
1210	Nortel SL-100	4.4 M*
1215	Lucent 5ESS-2000	3.9 M*
1400	**Large DSS** - basic switch for 35,000 subscriber lines and 7,000 trunks. Other features and functions such as Remote Switch, Nortel Mail Option, Nortel Message Service are available.	
1405	Nortel SL-100	12.3 M*
1410	Lucent 5ESS-2000	14.8 M*
1600	Modernization of Small AT&T G2.2 (GOE) Replace with Nortel Meridian 1 Option 81C	0.9 M *
1800	Modernization of Medium AT&T G2.2 (GOE) Replace with Lucent 5ESS-2000	3.9 M *
2000	Modernization of Small AT&T System 75 (GOE) Replace with Nortel Meridian 1Option 81C	0.9 M *
2200	Modernization of Small AT&T G3i (GOE) Replace with Nortel Meridian 1 Option 81C	0.9 M *
2400	Modernization of Medium AT&T G3r (GOE) Replace with Lucent 5ESS-2000	3.9 M *
2600	Modernization of Medium AT&T 5ESS (GOE) Lucent 5ESS-2000 Version Upgrade	2.4 M*
2800	Modernization of Large AT&T 5ESS (GOE) Lucent 5ESS-2000 Version Upgrade	12.0 M*
3000	Modernization of Small Nortel Meridian SL-1 Opt 61 (GOE) Upgrade to Nortel Meridian 1 Opt. 81C	0.7 M*
3200	Modernization of Medium Nortel Meridian SL-1 Opt 81 (GOE) Upgrade to Nortel Meridian 1 Opt. 81C	1.8 M*
3400	Modernization of Small Nortel SL-100 NT40 (GOE) Upgrade to Nortel SL-100 SuperNode SE	1.5 M*
3600	Modernization of Medium Nortel SL-100 NT40 (GOE) Upgrade to Nortel SL-100 SuperNode SE	3.3 M*
3800	Modernization of Large Nortel SL-100 SuperNode (GOE) Upgrade to Nortel SL-100 SuperNode DPCC	13.0 M*
4000	**ISDN Telephone Set**	
4001AA	Cortelco Model 2500-**-MBA-27M	31.00
4001AB	NT1/TA Motorola Bit SURFPro	382.70
4002AA	Cortelco ISDN Model CI1800-MOE-25D	321.95
4002AB	Motorola NT1D ISDN network termination device	164.94
4005	**Analog Telephone Set**	
4005AA	Cortelco Model 2500**-MBA-27M	31.00
4635	**SONET OC-3 Multiplexer**	
4636	Nortel S/DMS TransportNode OC-3 (R2.0)	32.6 K*
4637	Lucent DDM-2000 OC-3 (R9.0)	25.9 K*
4640	**SONET OC-12 Multiplexer**	
4641	Nortel S/DMS TransportNode OC-12 (R2.0)	53.2 K*
4642	Lucent DDM-2000 OC-12 (R5.0)	53.2 K*
4645	**SONET OC-48 Multiplexer**	
4646	Nortel S/DMS TransportNode OC-48	99.5 K*
4647	Lucent FT-2000 OC-48 Lightwave System (R7.1)	157.6 K*
4700	**Enterprise Connectivity, Interoperability, Communications, and Management (ECICM):**	
4705	**Building Level Router/Ethernet Switch**	
4705AA	Cisco4500-M(100 Mhz processor, 8 MB RAM, 4 MB flash, & 4 MB shared memory)	4,516.32
4705AB	Cisco IOS Software Release 11.1.6, SF-G45AN-11.1.6	4,064.68
4710	**Base Level Router/Ethernet Switch**	
4710AA	CISCO 7507 Router with one DC power supply, 1 RSP2 (RSP2) 11,667.13	
4710AB	Redundant AC Power Supply	4,516.32
4710AC	Cisco IOS Software Release 11.1.6	6,021.74
4710AD	7000 Router 1-Port (ST) SONET Singlemode IP, CX-AIP-SS	18,817.95
4710AE	7000 Family, 1-Port Fast Ethernet Fiber IP, CX-FEIP-1TX	7,903.53
4710AF	7000 Family, 2-Port Fast Ethernet UTP IP, CX-FEIP-2TX	10,538.05
4710AG	7000 Family, 2-Port (two AUI) Ethernet (10 Mbps) IP, CX-EIP2	5,269.02
4710AH	7000 Family, 1-Port FDDI Multimode to Multimode IP, CX-FIP-MM	13,548.94
4710AJ	7000 Family, 1-Port Channelized T1/ISDN PRI IP, CX-MIP-1CT1	8,279.89
4710AK	7000 Family, 2-Port Channelized T1/ISDN PRI IP, CX-MIP-2CT1	11,290.77
4710AL	Redundant DC Power Supply, PWR/7/2-DC	4,892.66
4710AM	CISCO 7507 Router with one AC	11,968.21

CLIN/ SCLIN	DESCRIPTION	PRICE
	power supply, 1 RSP2 (RSP2)	
4710AN	Additional RSP2 Module, RSP2	9,400.37
4710AP	RSP2 Module DRAM Memory 16 MB Upgrade, MEM-RSP-16M	783.36
4715	**Enterprise Level Concentrator** Cisco Catalyst 5000 Ethernet Switch	
4715AA	Catalyst 5000 Optional Redundant AC power supply,WS-C5008A/2	1,645.09
4715AB	Catalyst 5000 Single AC power supply, WS-C5008A	1,645.09
4715AC	Catalyst 5000 Concentrator chassis (1.2 Gbps switching backplane, 25 Mhz processor, 8 MB RAM, & 4 MB flash memory),WS-C5000	2,469.69
4715AD	Catalyst 5000 12-Port (RJ-45) 10/100 BaseTX Fast Ethernet Autonegotiation Interface Module, WS-X5213	7,919.38
4715AE	Catalyst 5000 Supervisor Engine 100BaseTX, WS-X5009	8,241.83
4715AF	Catalyst 5000 LAN Emulator Module, dual Phy, 2 Single-mode Fiber SC Ports, WS-X5157	11,884.37
4720	**Building Level Concentrator**	
4720AA	CISCO Catalyst 2900, fourteen 10/100BaseT port (RJ-45) Ethernet Switch, WS-C2901	11,881.06
4720AB	SmartSwitch II Chassis, 7C04-R	1,254.53
4720AC	SmartSwitch II Power Supply Module (AC), 7CPSM-R	618.03
4720AD	SmartSwitch II Switch Control Unit, 7X00	4,932.28
4720AE	SmartSwitch II (24 Port via dual RJ-45), 7E02-24	4,747.41
4725	**ATM**	
4725AA	FORE ASX 200BX ATM Switch Chassis with a 2.5 Gbps backplane, 4 LAN network module slots, and dual DC power supply slots, ASX200BX	12,637.74 **
4725AB	ForeThought Internetworking Software (ATM, IP, PNNI), FT-SW	2,373.04 **
4725AC	4-Port OC-3 SingleMode Card for Fore Systems ATMs, NM-4/155SMSRC	11,090.04 **
4725AD	FORE ASX 1000BX ATM Switch Chassis with a 10 Gbps, 16 LAN network module slots, and dual DC power supply slots, ASX1000BX	37,992.43 **
4725AE	Switching Software for IP, FT-SW	2,373.04
4725AF	4-Port OC-3 SingleMode Short Range Card, NM-4/155SMSRC	11,090.04
4730	**CSU/DSU**	
4730AA	T1/fractional T1 CSU/DSU w/SNMP control and LAN operation for 10BaseT ROUTERmate Plus-T1	982.43
4730AB	T1/fractional T1 CSU/DSU w/SNMP control capable of operation out to 6,000' ROUTERmate-T1	653.86
4735	**MUX**	
4735AA	Osicom TIE-6 Chassis, DS1 multiplexer with a built-in ESF/D4 CSU, 6 user slots (for up to 30 SDM data channels, 24 voice channels, or a mix), two control card slots, and capable of management by SNMP, includes common logic, logic adapter, and interface cards, TIE-6DC	2,668.03
4735AE	Osicom TIE-6 multiplexer DS0 subrate data multiplexer card, DCP9573	389.56
4735AF	Osicom TIE-6 multiplexer subrate data multiplexer, DCP9563	328.05
4735AG	Osicom TIE-6 multiplexer Dual Low Speed Synchronous Data Card, DCP9572	416.89
4735AH	Osicom TIE-6 multiplexer Low Speed Interface Module, RS232, DCP9554	115.01
4735AJ	Osicom TIE-6 multiplexer High Speed Synchronous Data Card, DCP9581	278.30
4735AK	Osicom TIE-6 multiplexer High Speed Synchronous Interface Module, RS232, DCP9558	109.35
4735AL	HyperSPAN 828A MX-3 Multiplexer chassis, ACX026G3	626.80
4735AM	HyperSPAN multiplexer Power Supply, -48DC, PSX016-1	496.81
4735AN	HyperSPAN multiplexer High Speed Common Card, CCA120G3	372.61
4735AP	HyperSPAN multiplexer B8ZS Entrance Link Card, CCA118G1	219.42
4735AQ	HyperSPAN multiplexer F.O. Transceiver, CCA121G1	3,623.38
4735AR	HyperSPAN multiplexer MPU, processor with TELTRAC/TBOS management monitoring, CCA162G4	293.94
4735AS	HyperSPAN multiplexer L.S. Interface T1 AMI/B8Zs, CCA161G3	515.02
4735AV	DL600 Encore E1/fractional E1 modular data multiplexer with SNMP management	3,170.17
4735AW	75ohm one port E1 ISDN/PRI multichannel I/F processor, CX-MIP-1CE1/75	8,282.21
4735AX	Channelized E1 ISDN/PRI network processor, NP-CEIB	2,070.55
4735AY	T1/E1 Rate and Interface Converter, SPD-T1/230/g802	3,566.50
4740	**Channel Banks**	
4740AA	Osicom Chassis, TIE-6DC	2,668.03
4740AE	Osicom TIE-6 multiplexer Quad Voice Channel Card (DS1/DS0 channel bank card), DCP9589	335.15
4740AF	Osicom TIE-6 multiplexer 2-Wire FXS Interface Module (DS1/DS0 channel bank card), DCP9540	224.08
4740AG	Osicom TIE-6 multiplexer 2-Wire FXO Interface Module (DS1/DS0 channel bank card), DCP9541	230.00
4740AH	Osicom TIE-6 multiplexer Dual Low Speed Synchronous Data Card, DCP9572	416.89
4740AJ	Osicom TIE-6 multiplexer Low Speed Interface Module, RS232, DCP9554	115.01
4740AK	Osicom TIE-6 multiplexer 2/4-Wire E&M, Dual Port Interface Module (DS1/DS0 channel bank card), DCP9544	224.08
4745	**INMCS**	
4745AA	HP 9000 D250/350 tower configured server w/2 120 Mhz processors and 128 MB RAM, A3333A*	19,293.34
4745AB	128 Megabyte ECC memory upgrade for HP Server, A3408A-0D1	3,042.57
4745AC	2 GByte SE SCSI-2 disk drive for HP Server, A3304A-0D1	990.42
4745AD	100 Base T Interface Card for HP Server, H-1000	732.90
4745AE	HP 700/96 console- 14" white screen sysops of HP Server, C1064WX-ABA	427.06
4745AF	Quad Speed CD-ROM drive SE SCSI-2 for HP Server, A3416A-0DS	396.17
4745AG	HP-UX Operating System for HP Server, A2440A-ABA-0D1	154.51
4745AH	HP-UX Operating System w/2 user license, Ver 10.20, A2440A-APZ	NC
4745AJ	HP-UX Operating System upgrade to 64-user license for HP Server, B3897A-AGP	7,527.18
4745AK	CD-ROM media and codeword certificate for HP server, B3897A-AJG	412.01
4745AL	HP-UX SW license for updates & phone access for HP server, B3897A-OSG	789.17
4745AM	HP 9000 D250/350 tower configured server w/1 120 Mhz, processor and 128 MB RAM, A3343A*	13,747.00
4745AN	128 Megabyte high density ECC memory,	3,042.57

CLIN/ SCLIN	DESCRIPTION	PRICE
	A3408A-0D1	
4745AP	2 GByte SE SCSI-2 disk drive, A3304A-0D1	990.42
4745AQ	Fast Wide Differential SCSI-2 Interface Card for HP server, A4107A	946.84
4745AR	2x2.1GB FWD Low-Profile High Performance Disk Module for HP server, A3311A-124	3,042.57
4745AS	100 Base T Interface Card, H-1000	732.90
4745AT	700/96 console-White screen, C1064WX-ABA	427.06
4745AU	4 GB DDS DAT drive w/data compression SE SCSI-2 for HP server, A3183A-0DZ	2,135.34
4745AV	Quad Speed CD-ROM drive SE SCSI-2, A3416A-0DS	396.17
4745AW	HP-UX Operating System, A2440A-ABA-0D1	154.51
4745AX	HP-UX operating system w/2 user license, Ver 10.20, A2440A-APZ	NC
4745AY	Upgrade to 64-user license, B3897A-AGP	7,527.18
4745AZ	CD-ROM media and codeword certificate, B3897A-AJG	412.01
4745BA	HP-UX SW license for updates & phone access, B3897A-OSG	789.17
4745BB	Sun SPARC 20 Model 71 configured server w/75 MHz processor, 2.1 GB hard drive, 4X CD-ROM drive, and SOLARIS 2.5 Operating System, S20TX1-71-32-P17	15,479.11
4745BC	64 MB RAM upgrade for Sun Server, X164P	1,193.79
4745BE	Internal 1.44 MB Floppy Drive for Sun Server, X6002A	132.71
4745BF	5 GByte 4mm DAT Drive for Sun Server, 6254A	1,305.08
4745BG	100BaseT Network Interface Card for Sun Server, X1059A	703.40
4745BH	Compaq Deskpro 2000 desk-top model with P/166 processor, 16 MB RAM, 2.5GB hard disk, 1.44 floppy disk drive, Win95 OS, 256K Cache, and 1 MB EDO DRAM Video Card, 244100-006	2,208.57
4745BJ	1 MB EDO DRAM Graphic Memory Upgrade for Compaq Deskpro 2000, 213922-001	52.56
4745BK	16 MB RAM Upgrade for Compaq Deskpro 2000, KTC2430/16	200.08
4745BL	32 MB RAM Upgrade for Compaq Deskpro 2000, KTC2430/32	355.43
4745BM	10BaseT NIC, PCI for Compaq Deskpro 2000, 242500-001	113.21
4745BN	Internal 28.8 kbps data/fax modem, for Compaq Deskpro 2000, 259213-001	187.52
4745BP	Internal 8X CD ROM drive for Compaq Deskpro 2000, 185262-001	300.14
4745BQ	QVision 210, 21" Monitor with 0.26mm dot pitch, 1600x1200 pixels @75 Hz, for Compaq Deskpro 2000, 210406-601	2,208.57
4745BR	Model 712/100 Performance Desktop Workstation with 100 MHz processor, A4345D	3,010.87
4745BS	21" viewable Color Monitor for HP Workstation, A4332A	2,452.27
4745BT	64MB RAM upgrade (two 32MB SIMMs) for HP Workstation, A2827A/0D1	1,267.73
4745BU	2GB SE SCSI-2 Disk Drive for HP Workstation, A4272A/0D1	792.34
4745BV	1.4 MB PC Floppy Disk Drive for HP Workstation, A4068A/0D1	99.04
4745BX	HP-UX Operating System upgrade to 2 licenses for HP Workstation, B3884EA-UA1-0D1	795.98
4745BY	HP-UX ver 10.20 kit on CD-ROM media and codeword certificate for HP Workstation, B3782EA-AAF-ABA	559.99
4745BZ	ENTRIA Plus X-Station with 4 MB RAM, C3264A-001-ABA	1,505.44
4745CA	8 MByte RAM upgrade for HP X-Station, C2323A	392.21
4745CB	ENWARE Software for HP X-Station, B3651FA	590.29
4745CC	21" multisynch monitor for X-Stations, XE21	2,130.06
4745CD	Laser Printer, 16 ppm at 600x300 dpi (8 ppm at 1200x1200) with 200 page paper tray (40#) Optra Rn+	1,876.33
4745CE	Laser Printer, 6 ppm at 600x600 dpi with 150 page paper tray (13.2#) Optra E	627.76
4745CF	Catalyst 2900-(14 ports), WS-C2901	11,881.06
4745CG	Message Detail Recording (MDR) Protocol Converter HW for 5ESS to TMA SIU, 5D709-30-G12	4,263.58
4745CH	28.8 Kbps External Modem, Courier V.Everything with V.34, 001224-0	293.49
4745CJ	Modular Alarm System Prewired Shelf, 400/Type 10, with 3 Positions (1 RUh by 19 or 23" w), D-RK-170-10A-00	238.20
4745CK	8 Port RS485/422 TBOS Card for MAS 400 rack powered by 48 VDC, D-MAS-46040-45	1,215.40
4745CL	TL1 Card for TBOS conversion for MAS 400 rack powered by 48 VDC, D-MAS-46060-45	1,704.02
4745CP	Remote Telemetry and Contact Alarm Monitor for up to 64 alarm points and 8 control points powered by 48 VDC, KDA864-B-01-04-02-00	1,581.87
4745CQ	SNMPTalk provides SNMP management of Osicom multiplexers and channel banks, DCP4810-325	1,139.50
4745CR	2 Port Remote Access Server to provide TCP/IP access over SNMP serial dial-up lines, LRS2	952.12
4745CS	Network Node Manager 4.x License-to-Use for HP OpenView network element discovery & monitoring, J1164AB-OS3	14,574.99
4745CT	Network Node Manager 4.1 CD ROM Media for HP-UX, J1170BA-OS3	67.35
4745CV	OfO-HP license, ORACLE 7.1.6 for OpenView (HP 9000 Server, HP UX), includes SQLNet for server and clients (includes license for server and up to 8 clients - client license is platform independent), ORA200AAy	10,260.73
4745CW	Oracle Developer 2000 (for HP 9000 Server, HP UX), includes Report writer and Developer/2000 documentation Library Set, E03378-1	3,958.38
4745CY	OfO-HP Software Update, ORACLE 7.1.6 for OpenView, ORA230AA-B00	309.01
4745DA	S/DMS Network Manager Release 5 S/DMS TransportNode Base Software RTU, A0641929	19,808.36
4745DB	S/DMS Network Manager Release 5 S/DMS AccessNode Base Software RTU, A0641930	19,808.36
4745DC	S/DMS Network Manager Surveillance Package RTU, A0620131	11,885.02
4745DD	S/DMS Network Manager Release 5 Software Tape, A0639921	142.63
4745DE	S/DMS Network Manager Software Management Package, A0620132	19,808.36
4745DF	S/DMS Network Manger Performance Monitoring package RTU, A0628386	11,885.02
4745DG	S/DMS Network Manger Remote Inventory Package RTU, A0628387	15,846.69
4745DH	S/DMS Network Manager Connection Management Package RTU, A0641620	23,770.04
4745DJ	S/DMS Network Manger S/DMS TransportNode SOC Connection RTU, A0408533	3,961.67
4745DK	S/DMS Network Manager S/DMS AccessNode SOC Connection RTU,	2,377.01

CLIN/ SCLIN	DESCRIPTION	PRICE
	A0622132	
4745DL	S/DMS Network Manager SOC Software Distribution RTU, A0620961	2,377.01
4745DM	S/DMS Network Manager SOC PM/Inventory Data Communication RTU, A0629202	2,377.01
4745DN	S/DMS Network Manager SOC Connection Management Package RTU, A0641621	2,377.01
4745DP	S/DMS Network Manager X terminal connection RTU, A0408534	3,961.67
4745DQ	ForView SNM based Network Management SW for Fore Systems Inc. ATM switches, FV-SW	7,920.70 **
4745DR	CiscoWorks 3.2.1 for HP OpenView HP-UX which provides SNMP management for Cisco equipment, CW-3.2.1-OVH	7,523.42
4745DS	Spectrum Portable Management Application, Core SW for SNMP management of SmartSwitch II under HP OpenView (at server), SPMA-5000 HHP1E	3,693.59
4745DT	Spectrum Portable Management Application, client SW for SNMP management of SmartSwitch II under HP OpenView (at SmartSwitch), SPMA-5038 HHP1E	1,382.62
4745DU	Link Management Application SW for SNMP management of LINK/2+ multiplexers, LMA/SUN OS	2,769.21
4745DV	Action Request System Server SW with Bundled Clients to trouble reports and action tracking, AR-SB-H7-HP9000	6,866.91
4745DX	Action Request System Basic Support Plans, TS-AR-BP	1,287.55
4745DY	Manakon X-elite UNIX based SW with X Windows/Motif graphic environment for telecommunications management including CDR/costing, traffic, alarms, voice mail, toll fraud, switch admin and configuration, assets, work-orders, reports, and directories, MX-BP3-40A	57,862.87
4745DZ	Licensing for additional Manakon X-elite user, MX-US3-N0Z	1,842.18
4745EB	UNIFY 5.0 Relational Database Managment System, installed in Telephone Management System host computer to update all related records with a single entry to the database, TMA-2	4,905.87
4745EC	Switch Interface Unit (SIU) hardware unit and software for SL-1 connectivity to Manakon X-elite, SU614-21-2	5,651.98
4745ED	Switch Interface Unit (SIU) hardware unit and software for 5ESS or SL-100 connectivity to Manakon X-elite, SU614-22-2	8,689.27
4745EF	Switch Interface Unit (SIU) hardware unit and software for Definity G3R connectivity to Manakon X-elite, SU614-11-2	5,651.98
4745EG	SW which processes all incoming events, traps, and messages from gateways and includes the IDEAS inference engine, the state transition diagrams, and the correlation & authorization agent modules Net Expert Run Time SW v3.4A	111,620.90
4745EJ	UNIX SW which provides presentation and management of messages Net Expert Operator W/S SW v3.4A	39,218.15
4745EK	Graphical User Interface toolkit which permits definition of real-time display of managed objects during run-time (requires SL/GMS SW) Net expert Visual Agent Server SW v3.4A	67,877.57
4745EL	Operator Workstation - Client SW which enables display of dynamic graphical screens depicting real world events Net Expert SL/GMS-R Graphics SW	6,284.95
4745EM	SW which receives traps from an SNMP agent and converts the Traps into events for use by and interface with IDEAS under the Run-Time SW Net Expert SNMP Gateway SW	13,575.52
4745EP	SW which reads ASCII data from a UNIX FIFO file, processes that data into events for use by and interface with IDEAS under the Run-Time SW Net Expert Generic Gateway SW	30,167.82
4745EQ	SW Protocol Agent which reads data from TL-1 based network element management systems, loads UNIX FIFO files, and interacts with Gateways (usually the Generic Gateway) Net Expert TL-1 Protocol Agent	27,151.02
4745ER	SW Protocol Agent which reads ASCII data from a TCP/IP socket, loads UNIX FIFOfiles, and interacts with Gateways (usually the Generic Gateway) Net Expert TCP-1P Protocol Agent	27,151.02
4745ES	SW Protocol Agent which reads data from a UNIX shell, loads UNIX FIFO files, and interacts with Gateways (usually the Generic Gateway) Net Expert Shell Protocol Agent	27,151.02
4745ET	Event Correlation Rule Set generation for Net Expert Enterprise Manager, EDS NMS-01	1,001,020.03
4745FA	VISIONAEL NetDesign - Windows 95/NT provides the software to generate and modify configuration management files and drawings, NDNDB	9,510.65
4745FB	VISIONAEL NetDB provides the Oracle interface for the CM integration system (included as part of 4745FA), NDB	
4745FC	VISIONAEL NetReview - NT/95 provides the user interface to view the network status through the CM system, NRNDB	2,377.66
4745FD	VISIONAEL NetReport Administrator - Windows 95/NT provides the control of users access for the report generation using the CM integration stystem, NANDB	1,545.47
4745FE	VISIONAEL NetReport User- Windows 95/NT provides the access for users to initate reports from the data and pictoral sets within the CM integration system, NUNDB	1,149.19
4745FQ	Microsoft Windows 95 version OS for PCs under Manakon X-elite	225.82
4745FR	eXceed 5 for Windows which provides X-Terminal sessions for SIUs under Manakon X-elite W3-000	235.06
4745FS	ATI TBOS NMS system V 4.x which provides management of microwave components from the INMCS, TBOS V4.X	6,505.79
4745FT	SeePort Wireless Management User Interface for SNMP management (requires MS-Windows 3), SP-NM	919.77
4745FU	7' access bandwidth manger (ABM) virtual tributary bandwidth management (VTBM) add-drop mux bay, NT4K03BB	5,083.14
4745FV	ABM bay installation kit, NT4K0120	431.74
4745FW	ABM Bay Top Support / Grounding Material, TBD-20	220.72
4745GA	Operations controller (OPC) module circuit pack with tape drive; provides and controls OAM&P functions for up to 16 network elements, NT7E24BC	4,610.46
4745GB	OPC software release AN11, NT4K90GA	108.02
4745GC	Fiberworld blank DAT tape, NT7E24TA	103.00
4745GD	ABM core software release AN12, NTG370AFy	200.22
4745GE	ABM processor card; provides cental control functions for AccessNode (ABM) and ABM OPC equipment, NT4K52FA	2,234.42

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CLIN/ SCLIN	DESCRIPTION	PRICE
4745GF	ABM maintenance interface card; provides alarm monitoring and supports human-machine interface, NT4K53AC	480.97
4745GG	ABM access interface card; provides interface between transport interface and copper distribution shelves for DS0s, NT4K55AA	1,721.65
4745GH	ABM transport interface card; formats DS0s into VT1.5 virtual tributaries, NT4K56AC	1,224.02
4745GM	OPC serial I/O card; provides interface for OPC serial ports 2 and 3, NT4K58LA	293.89
4745GN	ABM timing and cross-connect (TXC) card; provides system clocks and also cross-connects STS-1 signals between the transport interface and the DS1/VT mappers in DS1 fed systems, NT4K75AA	4,347.02
4745GP	DS1 VT mapper circuit card; provides interface between DS1 input/output cards and DS1/VT mapper. Each mapper card can support up to 14 DS1 inputs and outputs, NT7E04CA	2,041.76
4745GQ	DS1 input card; provides up to 14 DS1 input interfaces, NT4K32AA	246.16
4745GR	DS1 output card; provides up to 14 DS1 output interfaces, NT4K33AA	246.16
4745GY	SNMP Management for Windows (applicable to small bases without HP OpenView) SNMPc, V4.0	839.88
4750	**Power**	
4750AA	48 Volt DC, 10 Amp UPS System in a 7' rack, Lorain rectifiers, Absolyte batteries, breakers, alarms, and disconnects rated at 12.5 amps for 8 hours, 582102400-1.0	3,161.60
4750AB	48 Volt DC, 50 Amp UPS System in a 7' rack, Lorain rectifiers, Absolyte batteries, breakers, alarms, and disconnects rated at 54 amps for 8 hours, 582102400-3.0	6,259.79
4750AC	120 VAC UPS System for ISDN users at remote, BC PERS 200	95.34
4750AD	Skid mounted 60 KW Diesel Generator, 60 DGCB	25,672.95
4755	**Microwave**	
4755AA	Microwave Radio Frequency Unit, 7/8 GHz, FSK Plus, DS3 configured terminal, 7FP-DS3	37,804.58
4755AB	Digital (PCM) Party LineTelephone Orderwire with cable for remote troubleshooting, 705-200	2,641.12
4755AC	Rack, Steel,6ft x 19" wide, 4008-B13	512.58
4755AD	Waveguide, Elipitcal for 7.1to 8.5 GHz (ordered in feet), GEP-78	12.54
4755AE	Connector for GEP-78 waveguide, Antenna End, G78-112ET	228.53
4755AF	Connector for GEP-78 waveguide, Radio End, G78-112CT	217.89
4755AG	Waveguide Pressure Window for insertion of air pressure, WRWJ112	39.82
4755AH	Grounding kits for GEP-78 waveguide, GKE-78	22.97
4755AJ	Hoisting Grip for GEP-78 waveguide, HGE-78	39.07
4755AK	Angle Adaptor kit, HA-2	50.29
4755AL	Waveguide hangers kit, H-78	31.41
4755AM	Waveguide air pressurizer/dehydrator, MX-200-A	1,844.16
4755AN	Air Distribution Kit, 1 Outlet, with gauges, mounting HW and 20' of tubing (for end terminal sites), APD-1	75.27
4755AP	Air Distribution Kit 2 Outlets, with gauges, mounting HW and 30' of tubing (for repeater sites), APD-2	126.78
4755AQ	Twist-Flex Waveguide section, 2 ft, for joining main runs to antenna and terminals, WRFP-112-24	356.15
4755AR	Antenna, 6 ft Diam, Full Band 7.125-8.500 GHz, 40.50db gain, 1.5° beamwidth, plane polarized, SR6-71BSE	4,183.52
4755AS	Antenna Tower Mount, Pipe - with 4.5" OD Pipe Leg Clamp Kit, PMAC-1225	272.69
4755AT	Antenna Roof Mount, Tripod - with 4.5" OD Pipe 8 ft from base, G8	323.54
4755AU	100' Self-supporting tower, 5' triangular cross section, 80 MPH windload, 1/2" radial iceload, solid steel members U-5.0 x 100'	16,883.67
4755AV	48 Volt DC, 10 Amp UPS System in a 7' rack containing Lorain rectifiers, Absolyte batteries, breakers, alarms, and disconnects rated at 12.5 amps for 8 hours, 582102400-1.0	3,161.60
4760	**Synchronized Timing**	
4760AA	NETSYNC+ PRR-10 Primary Reference Receiver Chassis w/ dual power packs, 25412900-000-0	1,169.28
4760AB	NETSYNC+ PRR-10 Status Module for alarms and control, 23412896-000-0	167.84
4760AC	NETSYNC+ PRR-10 Rubidium Oscillator Module disciplined, by GPS for coasting if signal interrupted, 23412895-001-0	5,365.23
4760AD	NETSYNC+ PRR-10 GPS Reference Controller Module/DS1 Output, 23412887-007-0	4,251.90
4760AE	NETSYNC+ PRR-10 Reference Controller Module/DS1 Output, selects best reference source, 23412887-005-0	1,678.39
4760AF	NETSYNC+ PRR-10 DS1 Clock Output Module (10 outputs) - 2nd unit for protection, 23412898-000-0	1,113.33
4760AG	NETSYNC+ PRR-10 GPS L1 48 dB Antenna (w/type N connector 5" aluminum pipe /PVC base mount), 32012937-001-0	800.03
4760AH	NETSYNC+ PRR-10 Transient Eliminator (250B-90-1.5) Installed at building entry, 12812961-001-0	374.84
4760AJ	NETSYNC+ PRR-10 Antenna Cable segments (150' of RG-213 terminated in type N connectors), 12012959-003-0	391.62
4765	**Firewall System**	
4765AA	Sidewinder V3.1 w/ DEC Prioris HX server (w/64MB RAM, 40GB HD, 2 GB DAT, 15" SVGA Monitor) hardware and unlimited software license of the firewall, SW31-UL-4-DVP-C	44,647.25
4765AB	SSH Server License (per server) providing secure Remote Logon (rlog) for use in the firewall, SSH Server	587.64
4765AC	SSH Client (Unix) per client, for up to 1000 clients, providing secure remote UNIX proxy service SSH Client-Unix	101.02
4765AD	SSH Client (Windows) per client, for up to 1000 clients, providing secure remote TCP/IP proxy service, SSH Client-Win	101.02
4765AE	LANAserver 8e enterprise dial-in/dial-out access for the firewall system (8 EIA-232 ports each unit), 70001120	4,120.14
4765AF	FASTLANE ATM Encryptor provides full duplex ATM encryption/decryption and key management, KG-75	52,822.29 **
4765AG	Fast Ethernet (10/100 BaseT) cards provide the interface to the firewall protected networks, SWOP-FETH-B/B	264.20
4765AH	Premium software package Sidewinder V3.1 provides X.400/X.500 with mail filtering authentication and DMS strong authentication via LOCKout FORTEZZA, SWPF31-0-X4X5FT	9,246.48
4765AJ	PCMCIA Card Reader to enable full capability of the DMS strong authentication of LOCKout FORTEZZA,	792.57

CLIN/ SCLIN	DESCRIPTION	PRICE
	SWOP-PCMCIA-A/B	
4765AK	DEC Prioris HX server (w/64MB RAM, 40GB HD, 2 GB DAT, 15" SVGA Monitor) provides the firewall secure server systems hot spare, SWHW-D200-C	14,398.09
4765AL	Sidewinder V3.1 (standby license) for use on the hot spare firewall system, SW31-SP-4	3,302.31
4770	**Accessnode**	
4770AA	7' AccessNode Full Services Terminal/Remote Fiber Terminal (FST/RFT) Virtual Tributary Bandwidth Manager (VTBM) bay: - equipped with 2 Drawer Link Extenders (DLEs), - pre-wired for 14 Drawer Link Mappers (DLMs), NT4F51BA	8,111.36
4770AB	7' AccessNode Full Services Terminal/ Remote Fiber Terminal (FST/RFT) Virtual Tributary Bandwidth Manager (VTBM) bay, equipped with: - 1 Drawer Link Extender (DLE), - 1 Copper Distribution Shelf (CDS) in position 5, NT4F52BA	9,267.21
4770AC	ABM Bay Installation Kit, NT4K0120	431.74
4770AD	ABM Bay Top Support / Grounding Material, TBD-20	220.72
4770AK	AccessNode Drawer Link Mapper (DLM) card; handles traffic from/to one FST copper distribution drawer (48 lines), NT4F20AA	3,817.47
4770AM	AccessNode FST/RFT OC-1 multiplexer module, supports 8 DS1s, ST optical connectors. Provides OC-1 interface between FSTs and RFTs, NT2A12FA	5,567.14
4770AN	RFT OC-1 central office shelf. Accepts 10 OC-1 multiplexer modules, NT2A40BA	2,120.80
4770AQ	Newton 23" Rack (Flange), 4102-1	522.73
4770AR	Rack Installation Kit, TBD-21	387.89
4770AS	Core Software AN12, NTG370AF	200.22
4770AT	AccessNode SuperNode integration software, releases AN10/11/12, NTG375AD	NC
4770AU	Processor Card, NT4K52FA	2,234.42
4770AV	Maintenance Interface Card, NT4K53AC	480.97
4770AW	AccessNode test access card (TAC). Provides circuit-test access to line cards in copper distribution shelves, NT4K54AA	2,151.12
4770AX	Access Interface Card, NT4K55AA	1,721.65
4770AY	Transport Interface Card, NT4K56AC	1,224.02
4770BD	TXC Card, NT4K75AA	4,347.02
4770BE	AccessNode Copper Distribution Shelf. Each shelf provides 48 slots for line cards, NT4K12AB	1,741.34
4770BF	AccessNode CDS Power Converter (-48 VDC power supply). Two converters required per CDS shelf, NT4K62AA	671.09
4770BG	Metallic Test Access Card. Used to provide test connections for CDS line cards in RFTs. One card required per CDS, NT4K73AA	111.34
4770BH	NarrowBand Line Interface Card. Provides interface between line cards in CDS and the ABM shelf. Two required per CDS, NT4K70AA	273.44
4770BQ	Epsilon Station Line Card, 2-wire POTS services, Single 2-wire interface, NT4K65AB	104.52
4770BR	Omega 2-wire Station Line Card. Supports 2-wire analog and digital/ISDN subscriber loops, and COIN service, Single 2-wire interface. NT4K67AC	271.17
4770BS	DS1 Protection Bridge card. Provides connection between DS1 protection bus and the protection DS1/VT mapper, NT4K31AA	190.12
4770BT	DS1 VT Mapper, NT7E04CA	2,041.76
4770BU	DS1 Input, NT4K32AA	246.16
4770BV	DS1 Output, NT4K33AA	246.16
4770BW	(ABM)Main Power Cable, UL/CSA (35'), NT4K84UA	58.32
4770BX	ABM DS1 Cable (50'), NT4K85HH	113.62
4770BY	9/25-Pin User Interface Cable (5M), NT7E44EA	78.02
4770CC	Single Mode Optical Patchcord, 5 meters, ST-ST connectors, NT7E46CA	340.09
4770CD	FST mounted in 7' bay, NT4F71AA	5,717.88
4770CG	FST QRG, P0833113	65.85
4770CH	FST common-equipment kit, 96 line (2 per 96-line FST), contains - 1 D-link mapper,- 2 narrowband line-interface cards, - 1 single metallic test access card (type 2), - 1 CDS power converter, NT4F49BA	5,146.76
4770CJ	OC-1 Module e/w 8 DS1, SR (ST), NT2A12FA	5,567.14
4770CK	Epsilon Station Line Card, NT4K65AB	104.52
4770CL	Omega 2W Station Line Card, NT4K67AC	271.17
4770CN	SM Optical Patchcord 5m (ST-ST), NT7E46CA	340.09
4775	**Wireless LAN**	
4775AA	FREEPORT Wireless Ethernet HUB and antenna: Supports 62 transceivers to a distance of 260' with an omni-directional antenna and includes SNMP Agent, FP-H62.3	6,886.70
4775AB	FREEPORT Wireless Ethernet Transceiver with Multiport Interface Unit: Supports 8 separate 10BaseT (RJ-45) ports with connection to the Hub via a built-in omni-directional antenna, FP-TIU8.3	1,844.16
4775AC	FREEPORT Wireless Ethernet Transceiver: Supports one 10BaseT (RJ-45) port with connection to the Hub via a built-in omni-directional antenna, FP-T.0	1,566.84
4780	**Miscellaneous**	
4780AA	Equipment Rack (19" X 7'), 559260-1	288.55
4780AB	100Base-TX to 100Base-FX Media Converter, RJ-45 to ST, stand-alone unit with AC power supply, 100BTX-FRL-01	706.49
4785	**Rack Mounted Fiber Optic Modem (DS1 & DS3)**	
4785AA	DS3/SONET Fiber Optic Modem Chassis (Card Cage) with one AC Power Suply Card, FOM7500CPS	1,444.69
4785AB	Redundant AC Power Supply Card, FOM7500PS	520.30
4785AC	Fixed Rate DS3 Single Card Fiber Optic Modem, Multi-Mode (1300 nm) DS3/LED*MM	2,882.78
4785AD	Variable Rate DS1 Single Card Fiber Optic Modem, Multi-Mode (1300 nm), T1/E1/LED*MM	1,265.10
4785AE	DS3 Stand Alone, Single Mode (1300 nm) Fiber Optic Modem, with -48VDC power (25W), 2245-S-BNC-11-3	5,013.08
4790	**Radio Network System**	
4790AA	MASTR III Modular 5 channel Digital Repeater with GE Trunking Card and RF Combining Equipment providing high power base station for mobile and portable radios, SXRA	120,865.27
4790AB	Console Electronic Controller (CEC), providing interconnects between local and remote RF equipment, MSDE3D	78,277.68
4790AD	Telephone Switch Interconnect providing 3 interface channels between RF based traffic & local DSS (included as part of SCLIN 4790AA), SXMD3T	
4790AE	C3 Maestro Dispatch Console with system interface board, PC and Maestro SW, speakers/microphones, CRT02	13,360.75

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CLIN/ SCLIN	DESCRIPTION	PRICE
4790AF	Conventional Interface (CI) providing interface between analog and digital radio traffic (included as part of SCLIN 4790AB), MSZM7P	
4790AG	UHF Orion System Mobile Radios, 12 VDC powered, 403/430 Mhz, D2PMG2	2,606.18
4790AH	M-RK UHF Scan Model Portable Radio, 7.5 VDC battery powered, 403/430 Mhz, PK3PGT	2,174.23
4795	**SONET**	
4795AA	7'0" x 23" Bay Assembly, NT7E70AA	342.21
4795AB	Breaker Interface Panel (w/o Shelf Alarm Cable assy), NT7E56BA	811.99
4795AC	OC-3/-12 Transport Bandwidth Manager (TBM) Shelf, NT4K19AB	2,634.52
4795AD	TBM (VTBM) Cooling Unit Kit, includes: - 1 NT4K18BA cooling shelf - 1 NTK17BA cooling module, - 1 NT4K15CA air filter, - filler, washers, cable, and cable ties, NT4K11AB	631.23
4795AE	Shelf Alarm Cable Position 2 (TBM), NT7E5651	71.54
4795AF	TBM Cooling Unit - Air Filter, NT4K15CA	41.60
4795AG	Shelf Alarm Cable Position 1 (TBM), NT7E5650	68.15
4795AH	OC-12 Common Equipment (SRP Ring Only) which includes: NTZP33BA, - 1 Maintenance Interface Card (TBM), NT4K53AB, - 1 Applications Processor Card (TBM), NT4K52BC, - 1 External Sync. Interface Carrier, NT7E19AA, - 2 External Synchronization Interface, NT7E27BA, - 2 OC-12 Ring Loopback Unit (Extended Temp.), NT7E35AA, - 1 Ring Overhead Bridge Unit, NT7E36AA	5,936.25
4795AJ	TBM External Sync. Cable (15m), NT4K86EB	47.14
4795AL	Primary Operations Controller, consists of a four slot module (processor, memory, and hard disk) which performs monitor and control communications, software management, network surveillance & provisioning , data management, system security, NTZP37AC - 1 Operations Controller (OPC) e/w tape drive - 525 Meg HD, NT7E24BC - 1 Blank DAT Tape, NT7E24TA, - 1 OC-12 TBM Release 11.1, NT7E85LB - 1 OC-12 TBM rel. 11.1 SW Booklet, NT7E68DG	4,758.76
4795AM	Back-up Operations Controller four slot module, NTZP37BC - 1 Backup Operations Controller, NT7E24AC - 1 OC-12 TBM Release 11.1, NT7E85LB	3,665.57
4795AN	OPC Cable (Port B) - 5m, NT7E44RA	126.49
4795AP	Blank DAT Tape, NT7E24TA	103.00
4795AQ	OC-12 BLSR Ring System, NT7E80CD	13,807.62
4795AR	OC-12 OC-3/3c Tributary software right-to-use license, NT7E80AV	6,652.84
4795AS	OC-12 BLSR Matched Nodes software right-to-use license, NT7E80DL	5,543.57
4795AT	OC-12 336 virtual tributary - time slot assignment (VT-TSA) software right-to-use license, NT7E80DJ	4,434.30
4795AU	OC-3 intermediate reach 1310nm Networking Interface optical interface circuit pack with (FC) connectors. OC-3 low speed interface for OC-12 SONETmux, NT7E01DB	1,400.45
4795AV	OC-12 intermediate reach 1310nm optical interface circuit pack with virtual tributary bandwidth management (VTBM) at STS-1 and VT1.5 level, and with straight (ST) optical connectors, NT7E05BC	8,042.19
4795AW	Initial 14 DS-1 Package, NTZP35AA - 2 DS1/VT Synchronous Mapper, NT7E04CA, - 1 DS-1 Input Card (TBM), NT4K32AA, - 1 DS-1 Output Card (TBM), NT4K33AA	4,769.86
4795AX	Incremental 14 DS-1 Package; provides additional 14 full duplex DS1 interfaces with 1:N protection, NTZP35BA - 1 DS1/VT Synchronous Mapper, NT7E04CA, - 1 DS-1 Input Card (TBM), NT4K32AA, - 1 DS-1 Output Card (TBM), NT4K33AA	2,565.19
4795AY	TBM DS1 608 14 Pair Cable (15m), NT7E40BA	83.20
4795AZ	Initial STS-1 Package, NTZP35EA - 2 STS-1 Mapper, NT7E09AA, - 3 DS-3 Input/Output Card - BNC (TBM), NT4K30AA	6,031.65
4795BA	Incremental STS-1 Package; provides full duplex interfaces for additional 3 STS-1s with 1:N protection, NTZP35FA, - 1 STS-1 Mapper, NT7E09AA, - 3 DS-3 Input/Output Card - BNC (TBM), NT4K30AA	3,327.80
4795BB	DS-3/STS-1 Cable BNC/BNC, 10M, 734 cable, NTZP06BG - 2 DS-3 734 Coax Cable (10m)BNC, NT7E43AB, - 2 BNC Connector (734, Straight Crimp-on), A0609865	105.60
4795BC	Initial DS-3 Package, NTZP35CA - 2 DS-3 Mapper, NT7E08AA, - 3 DS-3 Input/Output Card - BNC (TBM), NT4K30AA	5,758.77
4795BD	DS-3 Protection Switch Card (TBM); provides protection switching for BNC (DS3 or STS-1) I/O via the DS3 STS mappers or STS-1 interfaces, NT4K60BA	213.54
4795BE	DS-3/STS-1 Cable BNC/BNC, 10M, 734 cable, NTZP06BG - 2 DS-3 734 Coax Cable (10m)BNC, NT7E43AB, - 2 BNC Connector (734, Straight Crimp-on), CX01PS007	105.60
4795BF	SM Optical Patchcord 5m (ST-ST), NT7E46CA	340.09
4795BG	SM Optical Patchcord 5m (ST-ST) with miniature variable-optical attenuator (mVOA), NT7E47CA	401.56
4795BH	Desk Telephone: Standard DTMF instrument with message waiting lamp 2500-**-MBA-27M	31.00
4795BJ	BitSURFRPro NTA: Desk-top unit with built-in NT-1 to support ISDN BRI channels, 6457504100010	382.70
5600	**MOE**	
5600AA	Ethernet AUI/10BaseT Transceiver, with RJ45 connector for UPT connectivity to new Routers, 36670L	90.20
5600AB	Ethernet AUI/10Base2 Transceiver, with BNC connector provides connectivity to 185M on 50ohm coax, 33405L	96.58
5600AC	10Base2 cable Tee Connector (50 ohm jack-plug-jack) with 12' drop cable, 414137-3	49.61
5600AD	Token Ring Extender with capability to provide remote connectivity up to 2 km on fiber (DB-9), 37740	617.42
5600AE	Low Profile Coaxial Tap (Vampire Tap), for 75 ohm 10Base5 Thicknet connection, 222290-2	207.46
5600AF	16' AUI Cable Assembly Transceiver, extends 10Base5, Thicknet connection, 222512-1	79.04
5600AG	Cisco 7000 Family Router Token Ring card (4 port) with 4 DB-9 connectors, CX-TRIP4	13,916.82
5600AH	7000 Router 2-Port Ethernet (10 Mbps) IP with AUI connectors, CX-EIP2	5,269.02
5600AJ	Token Ring Extender with capability to provide remote connectivity up to 2 km on	617.42

CLIN/ SCLIN	DESCRIPTION	PRICE
	fiber (RJ-45), 37741	
5600AK	4500M Router 2-Port Ethernet NPM with RJ-45 and AUI connectors, NP-2E	2,258.16
5600AL	Cisco 4500M Router Token Ring NPM with 1 DB-9 connector, NP-1RV2	1,778.26
6000	Pigtail Assembly with 4 SM & 4 MM fibers (ST connectors on one end and covered receptical) for mounting in the waterproof pierside patch panel, 1126456H	2,490.20
6001	**BASIC TERMINATION FOR PLUG CONNECTOR - UMBILICAL ASSEMBLY**	
6001AA	Umbilical Assembly of user specified length tactical cable with 4 SM & 4 MM fibers terminated with covered plugs, 1126457H	2,992.74
6001AB	SingleMode ST to ST Adapters for insertion into the waterproof pierside patch panel for connecting between the Pigtail Assembly and the source SM cable, C3050A-2	8.78
6001AC	MultiMode ST to ST Adapters for insertion into the waterproof pierside patch panel for connecting between the Pigtail Assembly and the source MM cable, C2050A-2	8.06
6002	Shore-to-Ship Fiber Cabling: The bulk 8 fiber tactical cable (4 SM and 4 MM starnds) from which the Umbilical Assemblies are made, H1240-S507T-08	3.28
6003	**WATERPROOF FIBER OPTIC PATCH PANEL ENCLOSURE**	
6003AA	Waterproof Fiber Optic Patch Panel Enclosure, A NEMA-4X box reconfigured from a standard Siecor Environmental Distribution Center (EDC-024) for terminating tactical cable and with an internal box for patching up to 8 STs to the Pigtail Assembly, EDC-024 (8 STs)	323.06
6003AB	Waterproof Fiber Optic Patch Panel Enclosure, A NEMA-4X box reconfigured from a standard Siecor Environmental Distribution Center (EDC-024) for terminating tactical cable and with an internal box for patching up to 16 STs to the Pigtail Assembly, EDC-024 (16 STs)	323.06
6003AC	ST connector Tool Kit, KIT	2,323.18
6003AD	Waterproof Fiber Optic Patch Panel Enclosure, A NEMA-4X box reconfigured from a standard Siecor Environmental Distribution Center (EDC-024) for terminating tactical cable and with an internal box for patching up to 24 STs to the Pigtail Assembly EDC-024 (24 Sts)	323.06
6300-6405	**WARRANTY** **Standard** 4 years Parts and Labor **Extended** 2 years Parts and Labor ** For additional Warranties see the Ordering Guide	
6500	**Communications Curriculum**	
6501	**Communications Curriculum - Data Networking (Basic)**	
6501AA	Learning Tree, Data Communications (Basic) - Introduction to Datacomm and Networks (Instructor Led), 4 days, 350	2,149.07
6501AB	Learning Tree, Local Area Networks (Basic) - Local Area Networks: Implementation and Configuration (Instructor Led), 4 days, 352	2,149.07
6501AC	Cisco Systems, Internetworking (Basic) - Introduction to Internetworking Self-Study Guide (Self-Study Guide), 8 hours, TRN -M040-01-00	64.11
6502	**Communications Curriculum - Data Networking (Intermediate)**	
6502AA	Learning Tree, Internetworking (Intermediate) - Internetworking: Bridges and Routers (Instructor Led), 4 days, 364	2,149.07
6502AB	Learning Tree, Networking (Intermediate) - Multivendor Networking (Instructor Led), 4 days, 361	2,149.07
6503	**Communications Curriculum - Data Networking (Advanced)**	
6503AA	Learning Tree, Internetworking (Advanced) - Hands-On Routers: Building Multiprotocol Internetworks (Instructor Led), 4 days, 465	2,149.07
6503AB	Learning Tree, Networking (Advanced) - Data Network Design and Performance (Instructor Led), 4 days, 453	2,149.07
6504	**Communications Curriculum - Telephony (Basic)**	
6504AA	Lucent, Telecommunications (Basic) - AT&T Telessentials Curriculum (CBT), 57 hours, TC1600	833.45
6505	**Communications Curriculum - Protocols/Standards (Basic)**	
6505AA	Bay Networks, Ethernet (Basic) - Ethernet Basics (CBT), 4-8 hours, AX0000075	192.32
6505AB	Bay Networks, FDDI (Basic) - Understanding FDDI (CBT), 16-20 hours, AX0000056	192.32
6505AC	Bay Networks, TCP/IP (Basic) - Understanding TCP/IP Protocols and Applications (CBT), 16-20 hours, Bay Networks, AX0000012	378.26
6505AD	Bay Networks, Token Ring (Basic) - Token Ring Basics (CBT), 4-8 hours, AX0000076	192.32
6506	**Communications Curriculum - Protocols/Standards (Intermediate)**	
6506AA	Learning Tree, Ethernet (Intermediate) - High Performance Ethernet: A Hands-On Workshop (Instructor Led), 4 days, 452	2,149.07
6506AB	Learning Tree, TCP/IP (Intermediate) - Hands-On Introduction to TCP/IP (Instructor Led), 4 days, 367	2,149.07
6507	**Communications Curriculum - Protocols/Standards (Advanced)**	
6507AA	Learning Tree, TCP/IP (Advanced) - Hands-On Internetworking with TCP/IP (Instructor Led), 4 days, 467	2,149.07
6507AB	Learning Tree, Networking (Advanced) - Computer Network Architectures and Protocols (Instructor Led), 4 days, 355	2,149.07
6508	**Communications Curriculum - WAN/Transport (Basic)**	
6508AA	FORE Systems, ATM (Basic) - Understanding ATM (CD ROM based CBT), 6 hours	192.32
6508AB	Learning Tree, ISDN (Basic) - ISDN for Telecommunications (Instructor Led), 4 days, 359	2,149.07
6508AC	Nortel, SONET (Basic) - SONET Overview (Self-paced, video), 1 day, 2002	224.39
6509	**Communications Curriculum - WAN/Transport (Intermediate)**	
6509AA	Learning Tree, Fiber Optics (Intermediate) - Implementing Fiber Optic Communications (Instructor Led), 4 days, 440	2,149.07
6509AB	Learning Tree, ISDN (Intermediate) - Implementing ISDN Data Networks: Hands-on (Instructor Led), 4 days, 374	2,149.07
6509AC	Learning Tree, Wide Area Network (Intermediate) - Telecommunications and Wide Area Networking (Instructor Led), 4 days, 373	2,149.07
6509AD	Learning Tree, Wide Area Networks (Intermediate) - High Speed Wide Area	2,149.07

CLIN/ SCLIN	DESCRIPTION	PRICE
	Networks (ATM, Frame Relay, SONET/SDH and Broadband ISDN) (Instructor Led), 4 days, 379	
6510	**Communications Curriculum - WAN/Transport (Advanced)**	
6510AA	Learning Tree, Wide Area Network (Advanced) - Hands-On Wide Area Network Troubleshooting (Instructor Led), 4 days, 456	2,149.07
6511	**Communications Curriculum - Net Management (Basic)**	
6511AA	Bay Networks, Network Management (Basic) - Introduction to Network Management (CBT), 4-8 hours, AX0000072	192.32
6511AB	Bay Networks, SNMP (Basic) - Understanding SNMP (CBT), 8-10 hours, AX0000011	250.04
6512	**Communications Curriculum - Net Management (Advanced)**	
6512AA	Learning Tree, SNMP (Advanced) - Hands-On SNMP: From Workgroup to Enterprise Networks (Instructor Led), 4 days, 464	2,149.07
6550	**Administration Curriculum**	
6551	**Administration Curriculum (Nortel SL-1)**	
6551AA	Nortel SL-1, Meridian 1 Options 11E-81C Familiarization, 3 days, 200	1,493.84
6551AB	Nortel SL-1, X11 Basic Database Administration, 7 days, 300	2,968.42
6551AC	Nortel SL-1, Basic Alternate Route Selection, 8 days, 320	3,301.81
6551AD	Nortel SL-1, Meridian Mail System Administration, 4 days, 361	1,737.47
6552	**Administration Curriculum (Nortel SL-100)**	
6552AA	Nortel SL-1, Introduction to Meridian SL-100 - This class is offered in the Central Time Zone, 4 days, 400	1,474.59
6552AB	Nortel SL-1, Meridian SL-100 Translations I (this class, in conjunction with 6552AC, is equivalent to 6552AG) - This class is offered in the Central Time Zone, 10 days, 500	3,917.30
6552AC	Nortel SL-1, Meridian SL-100 Translations II (this class, in conjunction with 6552AB, is equivalent to 6552AG) - This class is offered in the Central Time Zone, 3 days, 502	1,198.91
6552AD	Nortel SL-1, Meridian SL-100 SERVORD (equivalent to 6552AH) - This class is offered in the Central Time Zone, 4 days, 506	1,590.01
6552AE	Nortel SL-1, Meridian SL-100 ISDN BRI SERVORD (equivalent to 6552AJ) - This class is offered in the Central Time Zone, 3 days, 566	1,057.87
6552AF	Nortel SL-1, Meridian Mail System Administration - This class is offered in both the Eastern and Pacific Time Zones, 4 days, 361	2,149.07
6552AG	Nortel, DMS-100 Family System Translations (equivalent to 6552AB plus 6552AC) - This class is offered in both the Eastern and Pacific Time Zones, 11 days, 319	5,615.67
6552AH	Nortel, DMS superNode System Line Data Modification by SERVORD (equivalent to 6552AD) - This class is offered in both the Eastern and Pacific Time Zones, 4 days, 430	1,154.04
6552AJ	Nortel, Integrated Services Digital Network (ISDN) Basic Rate Interface (BRI) Service Order (equivalent to 6552AE) - This class is offered in both the Eastern and Pacific Time Zones, 3 days, 469	1,057.87
6552AK	Nortel, DMS SuperNode Hardware Architecture (equivalent to 6552AA, this class requires 6652AL as a prerequisite). This class is offered in both the Eastern and Pacific Time Zones. (Instructor Led), 3 days, 4004	1,057.87
6552AL	Nortel, Introduction to DMS SuperNode (video) (prerequisite to 6552AK), 1 day, 1001	160.27
6553	**Administration Curriculum (Lucent 5ESS)**	
6553AA	Lucent, 5ESS-2000 Switch Architecture (Instructor Led), 5 days, ES5010	2,596.59
6553AB	Lucent, 5ESS-2000 Switch ISDN Architecture Seminar (Instructor Led), 2 days, ES5090	1,038.63
6553AC	Lucent, Switch Translations: Essentials for Recent Change (Instructor Led), 4 days, ES505A	2,308.08
6553AD	Lucent, Switch Translations: Recent Change for Business Applications (Instructor Led), 5 days, ES505B	2,885.09
6553AE	Lucent, Switch Translations: Recent Change for ISDN (Instructor Led), 5 days, ES505C	2,885.09
6553AF	Lucent, Switch Translations: Recent Change for Routing, Charging and Digit Analysis (Instructor Led), 3 days, ES505D	1,731.05
6553AG	Lucent, Switch Translations: Recent Change for Trunks (Instructor Led), 2 days, ES505E	1,154.04
6554	**Administration Curriculum (Nortel Transportnode)**	
6554AA	Nortel, SONET Overview (Self-paced Video), 1 day, 2002	224.39
6554AB	Nortel, S/DMS TransportNode OC-3 Express OAM&P (Instructor Led), 2 days, 5502	897.58
6554AC	Nortel, S/DMS TransportNode OC-48 TA-1230 Ring OAM&P (Instructor Led), 5 days, 5508	2,243.96
6554AD	Nortel, S/DMS TransportNode OC-12 TA-1230 Ring OAM&P (Instructor Led), 5 days, 5509	2,243.96
6555	**Administration Curriculum (Nortel Accessnode)**	
6555AA	Nortel, S/DMS AccessNode Overview (Self-paced Video), 1 day, 2500	448.79
6555AB	Nortel, S/DMS AccessNode Operations, Administration, Maintenance, and Provisioning (Instructor Led), 6 days, 2501	2,692.73
6556	**Administration Curriculum (Cisco Systems 4000/7000 Routers)**	
6556AA	Cisco Systems, Introduction to Cisco Router Configuration (Instructor Led) 5 days, TRN-ICRC	2,301.65,
6556AB	Cisco Systems, Advanced Cisco Router Configuration (Instructor Led), 4 days, TRN-ACRC	2,301.65
6557	**Administration Curriculum (Fore Systems ASX 200BX/1000 ATM Switch)**	
6557AA	FORE Systems, Understanding ATM (CD ROM based CBT), 6 hours	192.32
6557AB	FORE Systems, ATM Configuration and Operation (Instructor Led), 2 days	1,525.90
6558	**Administration Curriculum (Cisco Systems Catalyst 5000/2900 Ethernet Switches)**	
6558AA	Cisco Systems, Catalyst 5000 (Instructor Led), 2 days, CAT5K	1,532.30
6559	**Administration Curriculum (Cabletron MMAC SmartSwitch)**	
6559AA	Cabletron, Ethernet 802.3 (Instructor Led), 3 days	1,538.71
6560	**Administration Curriculum (INMCS)**	
6560AA	Hewlett Packard, Fundamentals of the	2,243.96

CLIN/ SCLIN	DESCRIPTION	PRICE
	UNIX System (Instructor Led), 5 days, 51434S	
6560AB	Hewlett Packard, HP-UX 10.0 System Administration for the HP 9000 (Instructor Led), 5 days, H6296S	2,628.64
6560AC	Hewlett Packard, HP-UX 10.0 Network Administration (Instructor Led), 4 days, H6294S	2,160.60
6560AD	Nortel, SONET Overview (Self-paced Video), 1 day, 2002	224.39
6560AE	Nortel, S/DMS INA Transport GUI / S/DMS Network Manager Operations, Administration, and Surveillance. (Instructor Led), 1 day, 5421	897.58
6560AF	TMA Manakon, Elite System Administrator (Instructor Led), 18 hours, 401	4,231.47
6560AG	Secure Computing Corp, Sidewinder System Administrator (Instructor Led), 3 days, SWTR-A35-0	1,660.54
6561	**Administration Curriculum (SONET Multiplexer)**	
6561AA	Lucent, OC-3 Multiplexer Linear Networks, Operations and Maintenance. This class is offered in both the Eastern and Pacific Time Zones. (Instructor Led), 4 days, LW2603	2,134.97
6561AB	Lucent, DDM-2000 OC-12 Multiplexer Operations and Maintenance. This class is offered in both the Eastern and Pacific Time Zones. (Instructor Led), 5 days, LW2612	2,660.70
6561AC	Lucent, FT-2000 OC-48 Add/Drop-Rings Terminal Operations and Maintenance. This class is offered in both the Eastern and Pacific Time Zones. (Instructor Led), 3 days, LW2616	1,590.01
6600	**Installation and Maintenance Curriculum**	
6601	**Installation and Maintenance Curriculum (Nortel SL-1)**	
6601AA	Nortel, Meridian 1 Options 11E-81C Familiarization (Instructor Led), 3 days. This course is required to attain the minimum level of expertise to maintain a basic configuration of the DSS (No formal certification program is offered by the OEM), 200	1,493.84
6601AB	Nortel, Install and Maintain Meridian 1 Options 21E-81C (Instructor Led), 10 days. This course is required to attain the minimum level of expertise to maintain a basic configuration of the DSS (No formal certification program is offered by the OEM), 263	5,366.26
6601AC	Nortel, X11 Basic Database for Technicians (Instructor Led), 5 days. This course is required to attain the minimum level of expertise to maintain a basic configuration of the DSS (No formal certification program is offered by the OEM), 302	2,211.90
6601AD	Nortel, Meridian 1 Digital Trunk Interface (DTI) Installation and Maintenance (Instructor Led), 2 days, 261	1,352.79
6601AE	Nortel, Meridian 1/SL-1 ISDN Primary Rate Interface Installation and Maintenance (Instructor Led), 3 days, 262	1,410.49
6601AF	Nortel, Meridian 1 ISDN Basic Rate Interface Installation and Maintenance (Instructor Led), 5 days, 265	1,698.99
6601AG	Nortel, Meridian Mail System Administration (Instructor Led), 4 days, 361	2,149.07
6601AH	Nortel, Meridian Mail Installation and Maintenance (Instructor Led), 7 days. This course is required to attain the minimum level of expertise to maintain a basic configuration of the DSS (No formal certification program is offered by the OEM), 362	3,513.40
6602	**Installation and Maintenance Curriculum (Nortel SL-100)**	
6602AA	Nortel, Introduction to Meridian SL-100 - Is offered in the Central Time Zone. (Instructor Led), 4 days. Is required to attain the minimum level of expertise to maintain a basic configuration of the DSS (No formal certification program is offered by the OEM), 400	1,474.59
6602AB	Nortel, Meridian SL-100 Maintenance (equivalent to 6602AF plus 6602AG)- Offered in the Central Time Zone. (Instr. Led), 20 days. Req'd to attain min. level of expertise to maintain a basic configuration of the DSS (No formal certification prog. is offered by OEM), 441	7,751.26
6602AC	Nortel, SL-100 ISDN BRI - This class is offered in the Central Time Zone. (Instructor Led), 4 days, 565	1,583.58
6602AD	Nortel, Meridian SL-100 ISDN PRI (equivalent to 6602AH plus 6602AJ)- This class is offered in the Central Time Zone. (Instructor Led), 4 days, 508	1,186.10
6602AE	Nortel, Meridian Mail Installation and Maintenance-Offered in both Eastern and Pacific Time Zones. (Instr. Led), 7 days. Req'd to attain min. level of expertise to maintain a basic configuration of the DSS (No formal certification program is offered by OEM), 362	3,513.40
6602AF	Nortel, DMS SuperNode System Maintenance: Basic Platform Hands-On (equivalent to 6602AB, requires 6602AG as prerequisite) - This class is offered in both the Eastern and Pacific Time Zones. (Instructor Led), 5 days, 1146	1,763.11
6602AG	Nortel, DMS SuperNode System Maintenance: Basic Platform Computer-Based Training (prerequisite for 6602AF) (Instructor Led), 15 days, 1143	5,770.17
6602AH	Nortel, DMS SuperNode System Primary Rate Interface (PRI) Translations (equivalent to 6602AD, requires 6602AJ as prerequisite) - This class is offered in the Pacific Time Zone. (Instructor Led), 3 days, 7002	1,057.87
6602AJ	Nortel, Introduction to Integrated Services Digital Network (ISDN) Computer-Based Training (CBT) (prerequisite for 6602AH) (Instructor Led), 2 days, 170	769.36
6602AK	Nortel, DMS SuperNode Hardware Architecture (equivalent to 6552AA, this class requires 6652AL as a prerequisite). This class is offered in both the Eastern and Pacific Time Zones. (Instructor Led), 3 days, 4004	1,057.87
6602AL	Nortel, Introduction to DMS SuperNode (video) (prerequisite to 6552AK), 1 day, 1001	160.27
6602AM	Nortel, DMS-100 Family Basic Rate Interface Testing and Maintenance (equivalent to 6602AC, this class required 6602AJ as a prerequisite). This class is offered in both the Eastern and Pacific Time Zones. (Instructor Led), 5 days, 386	1,763.11
6603	**Installation and Maintenance Curriculum (Lucent 5ESS)**	
6603AA	Lucent, Introduction to the 5ESS-2000 Switch (Instructor Led), 4-5 days, ES5551	2,596.59
6603AB	Lucent, 5ESS-2000 Switch Maintenance (Instructor Led), 7-9 days, ES5554	4,673.81

CLIN/ SCLIN	DESCRIPTION	PRICE
6603AC	Lucent, 5ESS-2000 Switch Maintenance-Hands-On (Instructor Led), 10 days, ES5555	5,770.17
6603AD	Lucent, 5ESS-2000 Switch Translations (Instructor Led), 6-9 days, ES5561	4,673.81
6603AE	Lucent, 5ESS-2000 Switch ISDN Maintenance - Hands-On (Instructor Led), 5 days, ES5591	2,885.09
6604	**Installation and Maintenance Curriculum (Nortel Transportnode)**	
6604AA	Nortel, SONET Overview (Self-paced Video), 1 day, 2002	224.39
6604AB	Nortel, Transmission Node Installation, 4370	2,243.96
6604AC	Nortel, S/DMS TransportNode Ring System Installation (Instructor Led), 5 days, 4373	2,243.96
6604AD	Nortel, S/DMS TransportNode OC-3 Express OAM&P (Instructor Led), 2 days, 5502	897.58
6604AE	Nortel, S/DMS TransportNode OC-48 TA-1230 Ring OAM&P (Instructor Led), 5 days, 5508	2,243.96
6604AF	Nortel, S/DMS TransportNode OC-12 TA-1230 Ring OAM&P (Instructor Led), 5 days, 5509	2,243.96
6605	**Installation and Maintenance Curriculum (Nortel Accessnode)**	
6605AA	Nortel, S/DMS AccessNode Overview (Self-paced Video), 1 day, 2500	448.79
6605AB	Nortel, S/DMS AccessNode Operations, Administration, Maintenance, and Provisioning (Instructor Led), 6 days, 2501	2,692.73
6606	**Installation and Maintenance Curriculum (Cisco Systems 4000/7000 Routers)**	
6606AA	Cisco Systems, Installation and Maintenance of Cisco Routers (Instructor Led), 3 days, TRN-IMCR	2,301.65
6607	**Installation and Maintenance Curriculum (Fore Systems 200BX/1000 ATM Switch)**	
6607AA	FORE Systems, Understanding ATM (CD ROM based CBT), 6 hours	192.32
6607AB	FORE Systems, ATM Configuration and Operation (Instructor Led), 2 days	1,525.90
6608	**Installation and Maintenance Curriculum (Cisco Systems Catalyst 5000/2900 Ethernet Switches)**	
6608AA	Cisco Systems, Catalyst 5000 (Instructor Led),2 days, CAT5K	1,532.30
6609	**Installation and Maintenance Curriculum (Cabletron MMAC SmartSwitch)**	
6609AA	Cabletron, Ethernet 802.3 (Instructor Led), 3 days,	1,538.71
6610	**Installation and Maintenance Curriculum (SONET Multiplexer)**	
6610AA	Lucent, OC-3 Multiplexer Linear Networks, Operations and Maintenance. This class is offered in both the Eastern and Pacific Time Zones.(Instructor Led), 4 days,LW2603	2,134.97
6610AB	Lucent, DDM-2000 OC-12 Multiplexer Operations and Maintenance. This class is offered in both the Eastern and Pacific Time Zones.(Instructor Led), 5 days,LW2612	2,660.70
6610AC	Lucent, FT-2000 OC-48 Add/Drop-Rings Terminal Operations and Maintenance. This class is offered in both the Eastern and Pacific Time Zones. (Instructor Led), 3 days, LW2616	1,590.01
6650	**Operations Curriculum**	
6651	**Operations Curriculum (INMCS)**	
6651AA	Hewlett Packard, Fundamentals of the UNIX System (Instructor Led), 5 days, 51434S	2,243.96
6651AB	Hewlett Packard, HP-UX 10.0 System Administration for the HP 9000 (Instructor Led), 5 days, H6296S	2,628.64
6651AC	Hewlett Packard, HP-UX 10.0 Network Administration (Instructor Led), 4 days, H6294S	2,160.60
6651AD	Hewlett Packard, HP OpenView Network Node Manager Fundamentals for Network Managers (Instructor Led), 5 days, B4743S	2,994.08
6651AE	Nortel, SONET Overview (Self-paced Video), 1 day, 2002	224.39
6651AF	Nortel, S/DMS INA Transport GUI /S/DMS Network Manager Operations, Administration, and Surveillance. (Instructor Led), 1 day, 5421	897.58
6651AG	TMA Manakon, Elite System Administrator (Instructor Led), 18 hours, 401	4,231.47
6651AH	Secure Computing Corp, Sidewinder System Administrator (Instructor Led), 3 days, SWTR-A35-0	1,660.54
6700	**On-the-Job Training (OJT) Orientation and Operations Curriculum**	
8000	**CP Non-Cable Plant, Non-Switching Systems**	
8001	Principal Period of Maintenance (PPM) (CONUS)	147.90
8002	Outside the Principal Period of Maintenance (OPPM) (CONUS)	193.80
8003	SAT-SUN (CONUS)	193.80
8004	HOL (CONUS)	214.20
8005	Principal Period of Maintenance (PPM) (OCONUS)	178.50
8006	Outside the Principal Period of Maintenance (OPPM) (OCONUS)	229.50
8007	SAT-SUN (OCONUS)	229.50
8008	HOL (OCONUS)	255.00
8010	**GOE Non-Cable Plant, Non-Switching Systems**	
8011	Principal Period of Maintenance (PPM) (CONUS)	193.80
8012	Outside the Principal Period of Maintenance (OPPM) (CONUS)	219.30
8013	SAT-SUN (CONUS)	219.30
8014	HOL (CONUS)	239.70
8015	Principal Period of Maintenance (PPM) (OCONUS)	224.40
8016	Outside the Principal Period of Maintenance (OPPM) (OCONUS)	249.90
8017	SAT-SUN (OCONUS)	249.90
8018	HOL (OCONUS)	270.30
8020	**GOE Non-ISDN Capable SWitching Systems**	
8021	Principal Period of Maintenance (PPM) (CONUS)	147.90
8022	Outside the Principal Period of Maintenance (OPPM) (CONUS)	193.80
8023	SAT-SUN (CONUS)	193.80
8024	HOL (CONUS)	214.20
8025	Principal Period of Maintenance (PPM) (OCONUS)	178.50
8026	Outside the Principal Period of Maintenance (OPPM) (OCONUS)	229.50
8027	SAT-SUN (OCONUS)	229.50
8028	HOL (OCONUS)	255.00
8030	**GOE ISDN Capable Switching Systems**	
8031	Principal Period of Maintenance (PPM) (CONUS)	147.90
8032	Outside the Principal Period of Maintenance (OPPM) (CONUS)	193.80
8033	SAT-SUN (CONUS)	193.80
8034	HOL (CONUS)	214.20
8035	Principal Period of Maintenance (PPM) (OCONUS)	178.50
8036	Outside the Principal Period of Maintenance (OPPM) (OCONUS)	229.50
8037	SAT-SUN (OCONUS)	229.50
8038	HOL (OCONUS)	255.00

CLIN/ SCLIN	DESCRIPTION	PRICE
8040	**CP Digital Switching Systems**	
8041	Principal Period of Maintenance (PPM) (CONUS)	147.90
8042	Outside the Principal Period of Maintenance (OPPM) (CONUS)	193.80
8043	SAT-SUN (CONUS)	193.80
8044	HOL (CONUS)	214.20
8045	Principal Period of Maintenance (PPM) (OCONUS)	178.50
8046	Outside the Principal Period of Maintenance (OPPM) (OCONUS)	229.50
8047	SAT-SUN (OCONUS)	229.50
8048	HOL (OCONUS)	255.00
8050	**Cable Plant Maintenance**	
8051	Principal Period of Maintenance (PPM) (CONUS)	147.90
8052	Outside the Principal Period of Maintenance (OPPM) (CONUS)	193.80
8053	SAT-SUN (CONUS)	193.80
8054	HOL (CONUS)	214.20
8055	Principal Period of Maintenance (PPM) (OCONUS)	178.50
8056	Outside the Principal Period of Maintenance (OPPM) (OCONUS)	229.50
8057	SAT-SUN (OCONUS)	229.50
8058	HOL (OCONUS)	255.00
8100	**CP Non-Cable Plant, Non-Switching Systems**	
8101	Principal Period of Maintenance (PPM) (CONUS)	173.40
8102	Outside the Principal Period of Maintenance (OPPM) (CONUS)	219.30
8103	SAT-SUN (CONUS)	219.30
8104	HOL (CONUS)	239.70
8105	Principal Period of Maintenance (PPM) (OCONUS)	204.00
8106	Outside the Principal Period of Maintenance (OPPM) (OCONUS)	255.00
8107	SAT-SUN (OCONUS)	255.00
8108	HOL (OCONUS)	280.50
8110	**GOE Non-Cable Plant, Non-Switching Systems**	
8111	Principal Period of Maintenance (PPM) (CONUS)	214.20
8112	Outside the Principal Period of Maintenance (OPPM) (CONUS)	239.70
8113	SAT-SUN (CONUS)	239.70
8114	HOL (CONUS)	260.10
8115	Principal Period of Maintenance (PPM) (OCONUS)	244.80
8116	Outside the Principal Period of Maintenance (OPPM) (OCONUS)	270.30
8117	SAT-SUN (OCONUS)	270.30
8118	HOL (OCONUS)	290.70
8120	**GOE Non-ISDN Capable Switching Systems**	
8121	Principal Period of Maintenance (PPM) (CONUS)	173.40
8122	Outside the Principal Period of Maintenance (OPPM) (CONUS)	219.30
8123	SAT-SUN (CONUS)	219.30
8124	HOL (CONUS)	239.70
8125	Principal Period of Maintenance (PPM) (OCONUS)	204.00
8126	Outside the Principal Period of Maintenance (OPPM) (OCONUS)	255.00
8127	SAT-SUN (OCONUS)	255.00
8128	HOL (OCONUS)	280.50
8130	**GOE ISDN Capable Switching Systems**	
8131	Principal Period of Maintenance (PPM) (CONUS)	173.40
8132	Outside the Principal Period of Maintenance (OPPM) (CONUS)	219.30
8133	SAT-SUN (CONUS)	219.30
8134	HOL (CONUS)	239.70
8135	Principal Period of Maintenance (PPM) (OCONUS)	204.00
8136	Outside the Principal Period of Maintenance (OPPM) (OCONUS)	255.00
8137	SAT-SUN (OCONUS)	255.00
8138	HOL (OCONUS)	280.50
8140	**CP Digital Switching Systems**	
8141	Principal Period of Maintenance (PPM) (CONUS)	173.40
8142	Outside the Principal Period of Maintenance (OPPM) (CONUS)	219.30
8143	SAT-SUN (CONUS)	219.30
8144	HOL (CONUS)	239.70
8145	Principal Period of Maintenance (PPM) (OCONUS)	204.00
8146	Outside the Principal Period of Maintenance (OPPM) (OCONUS)	255.00
8147	SAT-SUN (OCONUS)	255.00
8148	HOL (OCONUS)	280.50
8150	**Cable Plant Maintenance**	
8151	Principal Period of Maintenance (PPM) (CONUS)	173.40
8152	Outside the Principal Period of Maintenance (OPPM) (CONUS)	219.30
8153	SAT-SUN (CONUS)	219.30
8154	HOL (CONUS)	239.70
8155	Principal Period of Maintenance (PPM) (OCONUS)	204.00
8156	Outside the Principal Period of Maintenance (OPPM) (OCONUS)	255.00
8157	SAT-SUN (OCONUS)	255.00
8158	HOL (OCONUS)	280.50

ViViD Website: vivid.gte.com
GTE Help Desk: 1-888-483-8831

Navy IT Umbrella Program Website:
http://www.chips.navy.mil/it

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